APRIL

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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Service Versus Salesmanship—*Rinehart*
Cavity Preparation and Inlay Casting—*West*
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Vice President of the American Dental Association

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Original Communications

THE ANATOMY OF THE MAXILLA FROM THE POINT OF VIEW OF FULL DENTURE PROSTHESIS*

By ELBERT C. PENDLETON, D.D.S., Chicago, Ill.

FROM a review of dental literature, one must realize that the technics employed in full denture construction are in the main the result of clinical observation rather than of histologic study. The limited number of data obtained from works that refer to the edentulous jaws were based on a study of dried specimens, roentgenograms and small tissue sections, and it is hardly within the scope of one's power to piece together these elements that have been studied separately. The descriptions were very general in character; but one is impressed with the ambition and desire of those men to obtain a better knowledge of the parts, although inadequate material for study limited their endeavors.

Just as harmony is the keynote in esthetics, equilibrium is the watchword in full denture retention. Equilibrium must be maintained under stress. To accomplish this objective, the distribution and extent of the compressible tissues should be understood and a technic of impression taking must be employed that will produce stability of the dentures. Quoting from Wilson, "The soft tissue is the factor that creates the variableness in impression taking."[1] Therefore, both in principle and in clinical practice, the chief factor in producing a completed denture which has stability is that of acquiring equilibrium.

A topographic picture (Fig. 1) of the structures provides a basis for visualizing the areas of the jaws that are particularly

*From the Research Department (Rudolf Kronfeld, Director) of the Chicago College of Dental Surgery, Dental Department of Loyola University.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

1. Wilson, G. H.: Dental Prosthesis, Philadelphia: Lea & Febiger, 1920.

suited to bear stress, those which must be relieved, others that may become areas of equalization, because of their cushion-like structures, and still others that may be utilized to obtain valve seal.

CLINICAL DESCRIPTION OF THE AREAS OF THE EDENTULOUS MAXILLA IN THEIR RELATION TO FULL DENTURE RETENTION

Before attempting a detailed description of the parts as they are found in the specimens studied, a description of the denture area will be given as it presents itself to the clinician. An effort has been made to select suitable and distinguishing characters for these areas which will be in accord with the part played by them in the scheme of full denture retention.[2] From time to time, reference will be made to these clinical divisions as the histologic sections are presented and described.

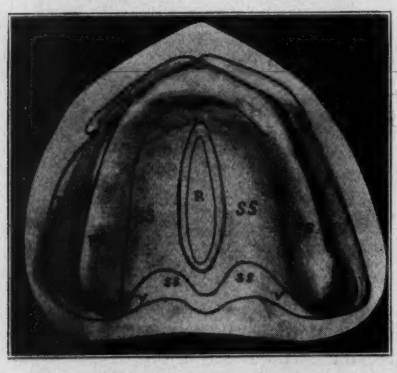

Fig. 1.—Maxillary cast picturing outline of areas of retention. *PS*, primary stress-bearing area; *R*, relief area; *SS*, secondary stress-bearing area; *V*, valve-producing area.

The denture areas comprise those regions of the vault, ridges and movable structures of the jaws that are most advantageous and congenial to the retention of the artificial denture.

For the sake of description, the maxillary area is divided into the primary stress-bearing area, the relief area, the secondary stress-bearing area and the valve-producing area.[3]

1. The primary stress-bearing area includes the residual ridges to the point of insertion of the muscles on the buccal and labial and to the compressible structures on the lingual surface.

Because of the character of the osseous structures and of the tissues that comprise their covering, the ridge seems particularly suited to bear the stress of artificial dentures.

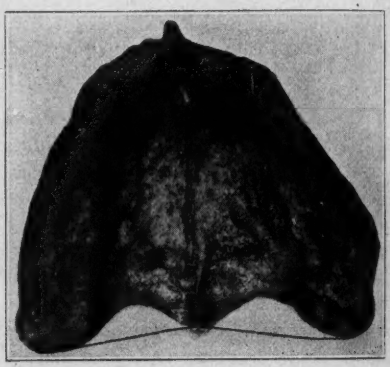

Fig. 2.—Edentulous maxilla, showing convoluted outline form of posterior border of palate bones. A line drawn across the posterior nasal spine and continuing to each tuberosity indicates the outline of the conventional form presented by many maxillary dentures. (Photograph of a specimen in the collection of J. Roy Blayney.)

The ridge may be described as having a base and crest with labial, buccal and lingual surfaces. Its structures are composed of bony and soft tissue. Its form

2. Supplee, S. G.: Classification of Tissue Conditions in Mouth as Related to Efficient Dentures, Dent. Cosmos, 60:996 (Nov.) 1918.

3. Pendleton, E. C.: Impressions for Full Dentures, J.A.D.A., 15:1027 (June) 1928.

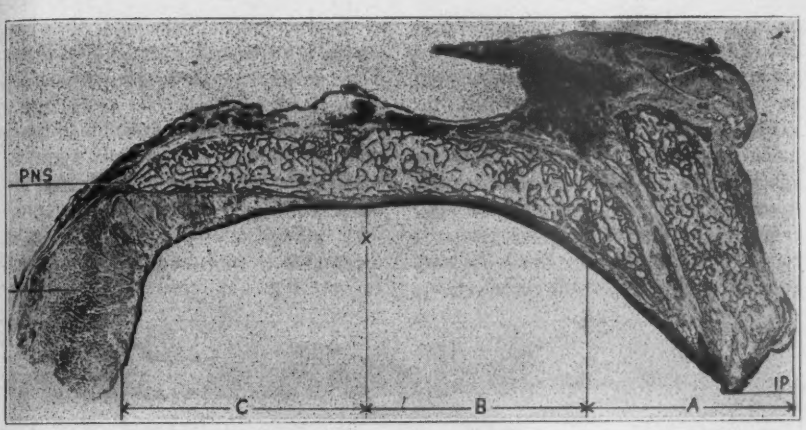

Fig. 3.—Sagittal section through the median line of edentulous maxilla. *A*, area of maxillary ridge and incisive foramen; *B*, hard palate; *C*, soft palate; *IP*, incisive papilla; *X*, crest of ridge of maxillary suture; *PNS*, posterior nasal spine; *V*, velum.

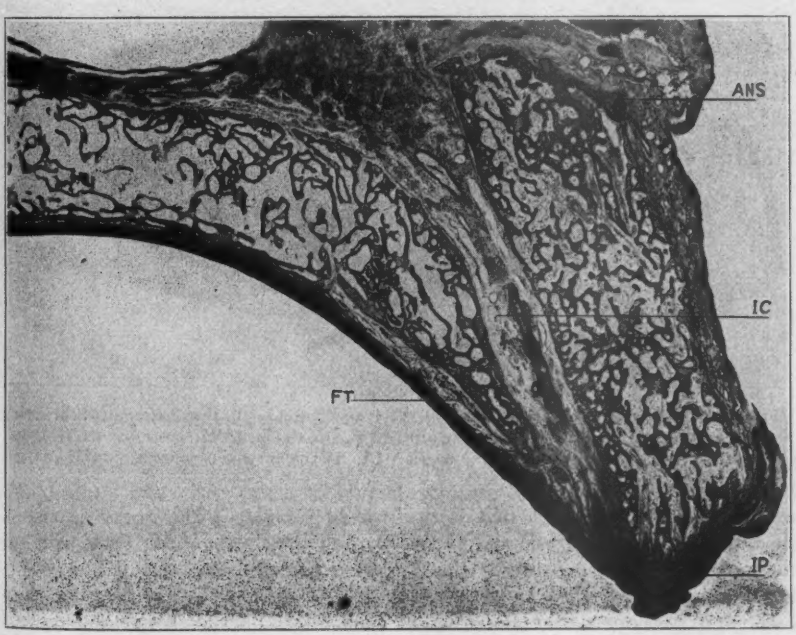

Fig. 4.—Higher magnification of anterior part of Figure 3. *IP*, incisive papilla; *IC*, incisive canal; *FT*, fat tissue; *ANS*, anterior nasal spine.

is inconstant. The posterior portion, or tuberosity, is bulky in comparison to the other areas. The soft portion of the crest may present a pendulous area in the region formerly occupied by the third molar. Progressing anteriorly from the tuberosity, the form of the ridge is more symmetrical as it approaches the bicuspid region. The base of the ridge gradually tapers to its crest and extends forward in a converging line to the cuspid region, of the tuberosity. Otherwise, the characteristic form of the outer surface of the ridge is concave from the base to the crest.

The mucous covering of the ridge is thin. It appears only slightly compressible except in the region of the incisive fossa, where the structures have a somewhat greater elasticity. The region of the zygomatic process is more compact. Its covering is extremely thin. The un-

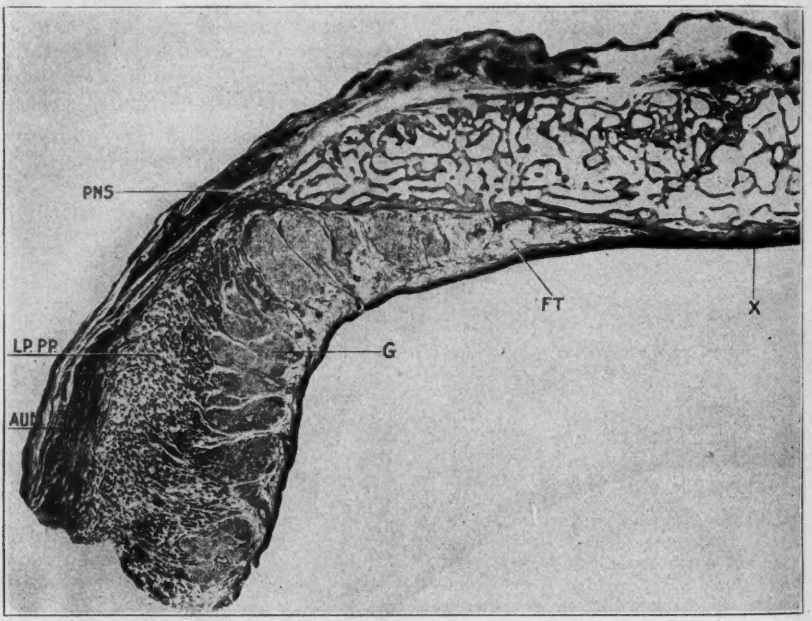

Fig. 5.—Higher magnification of posterior part of Figure 3. *X*, thin mucoperiosteal lining of vault at crest of ridge of maxillary suture; *FT*, fat tissue; *PNS*, posterior nasal spine; *G*, mucous glands; *LP*, levator palati muscle; *PP*, palatopharyngeus muscle; *AUM*, azygos uvulae muscle.

where it forms an arc with that of the opposite side. The buccal and labial surface of the ridge may show an irregular outline in cases of recent extraction. Jaws that have been edentulous for a long time may present prominently contoured surfaces, particularly in the region yielding tissues in this region present a critical area from the standpoint of overextension of the denture base.

The lingual surface of the ridge has a symmetrical outline, smooth and regular, sloping from its crest to the union of its base with the vault of the palate.

The covering of the bony ridge is of a firm semi-elastic structure. It is usually dense and uniform throughout, although irregularities may occur in the extreme areas as in the incisal and tuberosity regions.

From a denture standpoint, the width of the base of the bony ridge is far more important as regards the stability of a denture than is the height of its crest.

unstable because of the unyielding character of its structures. Its anterior border lies lingually to the incisive papilla which marks the inferior opening of the incisive canal. Extending posteriorly, the ridge of the maxillary suture broadens toward the maxillary ridge until its form resembles the kernel of an almond. Its convex surface has a covering which is thin and unelastic.

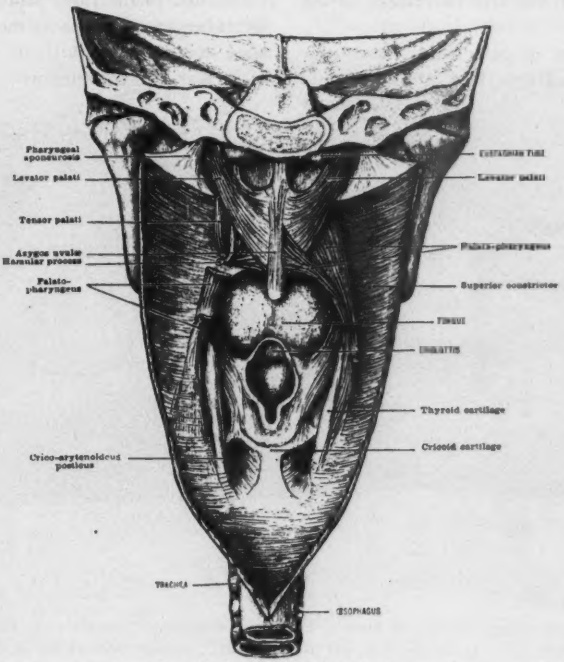

Fig. 6.—Muscles of soft palate. (Plate from Morris' Human Anatomy, Fig. 558 B.)

2. The relief area is that portion of the denture area that should be free from the stress imposed upon the maxillary denture.

In the median line of the vault, at the union of the maxillae and of the palate bones, is the maxillary suture. Its bony structure is compact; its form is irregular, and dentures resting upon it are

3. The secondary stress-bearing area includes all of the vault of the palate except the area of relief. Its posterior boundaries are limited only by the elasticity of the structures that form the soft palate. A marked color contrast is noted between the surface covering of the hard and of the soft palate. The epithelial covering of the soft palate is of a finer

texture and much more highly colored than that of the hard palate. A sharp line of demarcation is seen at the border between the two parts. This line is important as a guide in determining the length of the denture base, because the denture must extend upon yieldable tissue in order that a postvalve may be obtained. On the other hand, the posterior border of the denture must not interfere with the free movement of the soft palate.

The velum, or soft palate, is usually very elastic. Its surface is smooth and even surface that forms a dense cushion in this sector. A region of perceptible compression may be noted at the border of this area, following a somewhat uneven line at the junction of the palate and the base of the maxillary ridge.

4. The valve-producing area is the periphery of the denture area. On the buccal and labial surface, it begins at the point of insertion of the muscle tissue as it is attached to the ridge and extends into the culdesac as far as its movable structures will permit without interference with their free movement.

Fig. 7.—Higher magnification of area *X*, Figure 5, immediately posterior to crest of ridge of maxillary suture. *FT*, fat tissue; *FM*, fat marrow; *MP*, mucoperiosteal lining of the vault.

sometimes very dense. Its succulence indicates the presence of glands. Numerous pits in the surface are the openings of ducts from the glands beneath. This glandular area seems to be confined to the velum and the areas of the hard palate corresponding to the molar region.

The structures in the anterior portion of the hard palate are more irregular in their outline. The rugae develop an unA form that is characteristic is thus developed by the buccal and labial rim of the maxillary denture. It arches from the posterior border of the tuberosity into the zygomatic fossa. Here, the rim is high. As it progresses anteriorly, its curve is reduced to a sweeping plane in the region of the zygomatic process, where a very low point is reached to accommodate the attachments of the buccal

frenum. In another sweeping curve, the rim rises into the incisive fossa, then sharply descends in the median line to accommodate the labial frenum.

At the posterior palatal border, another distinctive design is presented. The border of the denture should extend out onto the tissues of the soft palate. At this point, perhaps the most efficient valve may be produced by giving to the posterior palatine border of the denture the outline form of the posterior border of the hard palate. (Fig. 2.) Such a form insures a maximum contact with soft tissue and at the same time provides free movement of the structures of the velum. The posterior nasal spine is usually in a horizontal plane with the distal portion of the maxillary ridge. Between these two landmarks on each side of the median line, the posterior palatal border is concave from before backward; therefore, the posterior palatal border of the maxillary denture should be designed to the form of this convoluted outline.

HISTOLOGIC DESCRIPTION OF THE AREAS OF THE EDENTULOUS MAXILLA AND THEIR SIGNIFICANCE IN FULL DENTURE RETENTION[4]

For our study, several complete max-

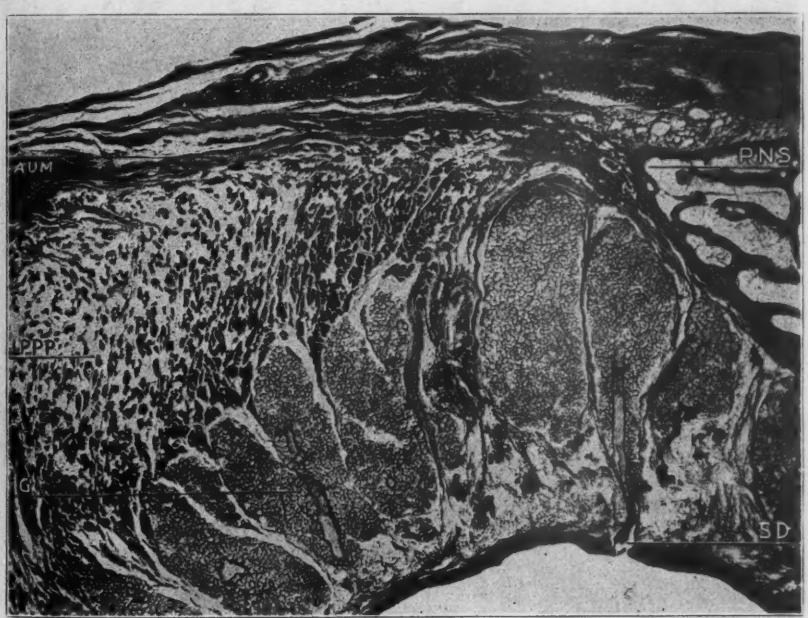

Fig. 8.—Higher magnification of postdam area from Figure 5. *PNS*, posterior nasal spine; *SD*, secretory duct; *G*, mucous glands; *LP-PP*, levator palati and palatopharyngeus muscles; *AUM*, azygos uvulae muscle.

4. A preliminary report was presented, April 8, 1930, at the Annual Homecoming and Clinic of the Alumni Association of the Chicago College of Dental Surgery, Dental Department of Loyola University; also before The International Association of Dental Research, March 22, 1931.

illae were secured with bone and well-fixed soft structures. Sections were made that showed the tissues in their undisturbed relationship. Three jaws from subjects of different ages have been studied. One edentulous jaw was from a woman, aged 58. The appearance of the specimen and the histologic findings would indicate that the teeth had been extracted many years and that the soft tissues were well healed. The two others, both of men, aged 43 and 45, respectively, had a few remaining teeth in the arches, but the edentulous spaces were in such a clinical and histologic state that they afforded sections of an area suitable for microscopic study. The specimens were fixed in formalin (formaldehyd) shortly after death. Photographs, roentgenograms and impressions of the specimens were taken. They were then decalcified in 5 per cent nitric acid and imbedded in celloidin. Serial sections across the entire width of each specimen were stained with hematoxylin and eosin. In order to take every possible advantage offered by the material, the jaws were sectioned in different directions. In one jaw, the sections were made in a sagittal plane, showing the structures all of the way through from the anterior nasal spine, over the edentulous ridge of the incisal area, back to the posterior nasal spine and including about one-half of the soft palate. Other sections were made in the frontal plane (buccolingual),

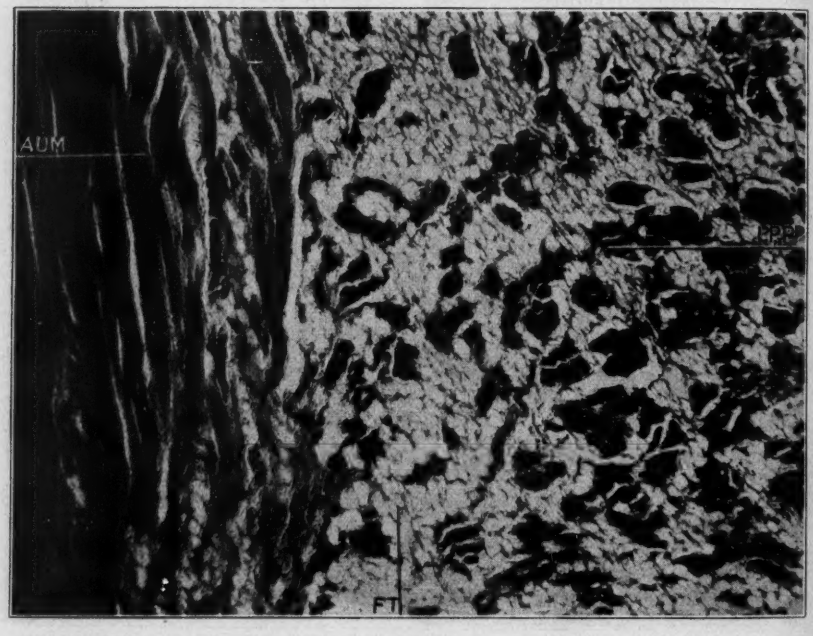

Fig. 9.—Higher magnification of Figure 3. *LP-PP*, cross-sections through bundles of levator palati and palatopharyngeus muscles; *FT*, fat tissue between muscle fibers; *AUM*, longitudinal fibers of azygos uvulae muscle.

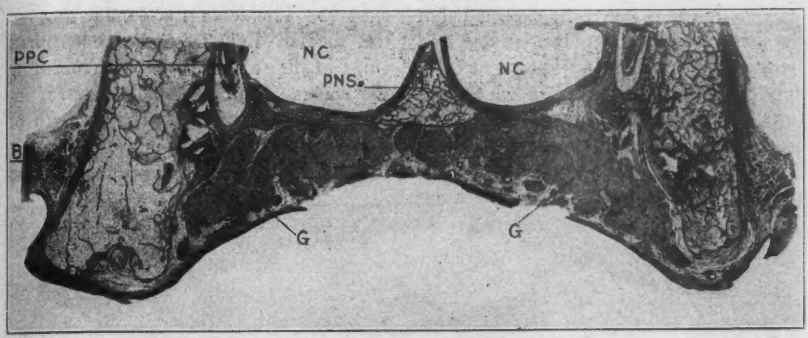

Fig. 10.—Frontal section through upper jaw in region of pterygopalatine canal. *PPC*, pterygopalatine canal; *NC*, nasal cavity; *G*, mucous glands of palate; *BM*, buccinator muscle; *PNS*, posterior nasal spine.

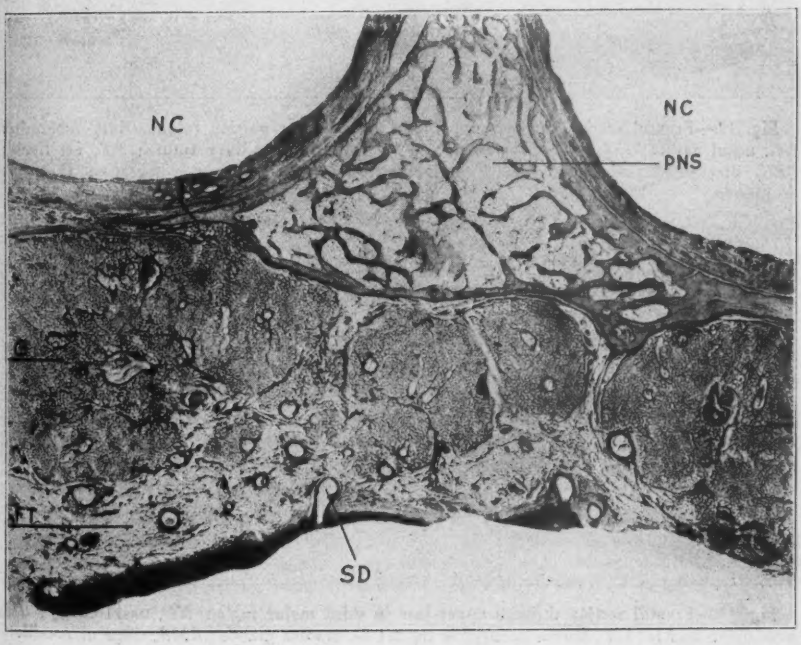

Fig. 11.—Higher magnification of central portion of Figure 10. *PNS*, posterior nasal spine; *NC*, nasal cavity; *G*, mucous glands; *SD*, secretory ducts; *FT*, fat tissue.

showing the ridges both in the molar and in the bicuspid regions, the palate and the floor of the nose between the ridges.

A third group of sections was made through the anterior portion of the edentulous jaw in a labiolingual direction.

Although it is not to be expected that the material which has been studied will represent all of the various structural developments to be found in edentulous jaws, it is true that the different areas are characteristic, and with reservations each may be accepted as not unlike the same region or part found in another specimen.

Figure 3 shows a sagittal section through the edentulous maxilla of a man, aged 45. This section was made through the median line from the edentulous ridge in the region formerly occupied by the central incisor teeth, backward, including about one-half of the length of the soft palate. Although it does not include the whole of the velum, it covers an area greater than that covered by the base of the artificial denture. In this section, only a part of the nasal septum may be seen in the anterior portion, be-

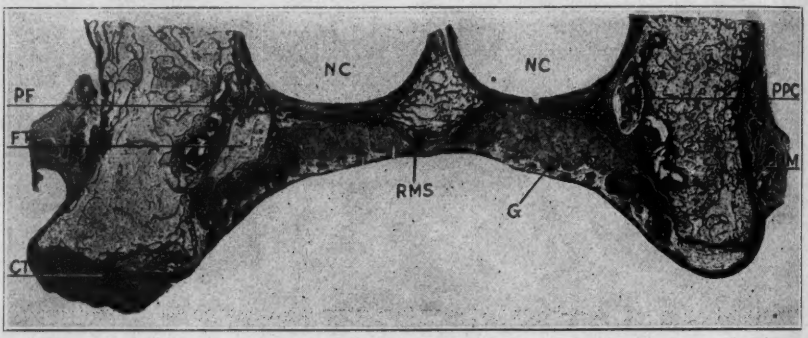

Fig. 12.—Frontal section through upper jaw at posterior portion of maxillary tuberosity. *NC*, nasal cavity; *CT*, connective tissue; *RMS*, ridge of maxillary suture; *FT*, fat tissue; *PPC*, pterygopalatine canal; *BM*, buccinator muscle; *GPF*, greater palatine foramen; *G*, glands.

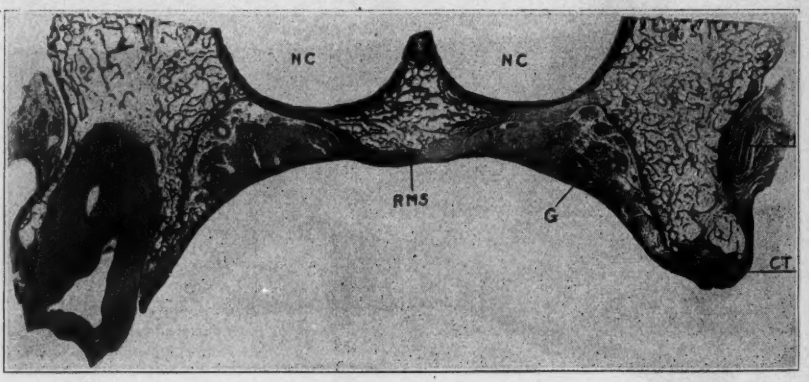

Fig. 13.—Frontal section through upper jaw in third molar region. *NC*, nasal cavity; *BM*, buccinator muscle; *CT*, fibrous connective tissue; *G*, mucous glands; *RMS*, ridge of maxillary suture.

cause of its usual deflection from the median line. For better orientation in these very large sections, it seemed practical to subdivide each into three different areas, namely, *A*, the alveolar ridge and area of the incisive foramen; *B*, the height of the vault, and *C*, the posterior portion of the vault and the beginning of the soft palate.

From a general view of Figure 3, it is evident that the mucosa covering areas *A* and *B* is attached closely to the bone. Between the bone and mucosa, there is only a thin layer of fibrous connective tissue in the region of the ridge. In the posterior part, at *C*, the soft tissue suddenly becomes much thicker, the mucosa being farther and farther from the bone as we approach the soft palate. The bone lies in a horizontal plane from a position where the increase in the thickness of the soft tissue is seen (border between *B* and *C*) to the posterior nasal spine. The muscles that form the soft

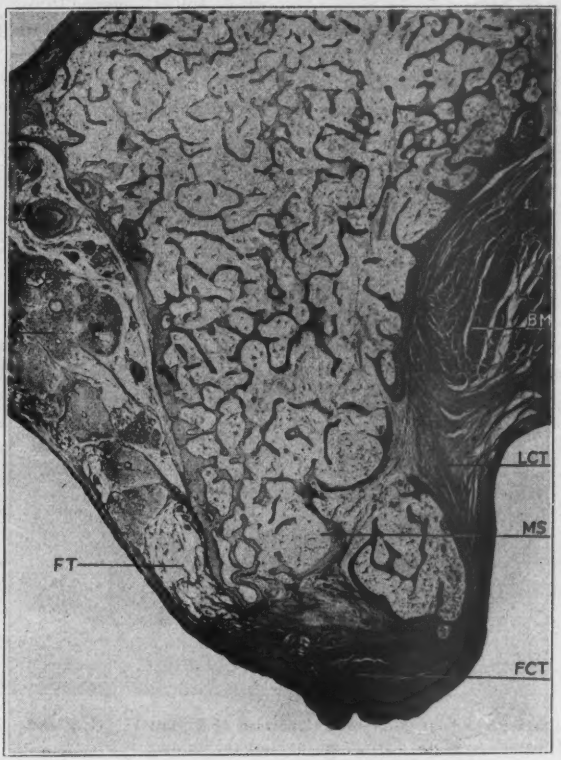

Fig. 14.—Higher magnification of edentulous maxillary ridge in Figure 13. *BM*, buccinator muscle; *LCT*, loose connective tissue on buccal side of ridge; *MS*, marrow spaces in cancellous bone; *FCT*, fibrous connective tissue on crest of ridge; *FT*, fat tissue; *PN*, palatine nerves; *G*, glands; *PA*, palatine artery.

palate are attached to the posterior border of the hard palate by an aponeurosis. The area between the muscles and the oral mucosa covering the soft palate is occupied by mucous glands.

Figures 4 and 5 are somewhat higher magnifications of the anterior and posterior portions of Figure 3.

Figure 4 illustrates the arrangement and distribution of hard and soft tissues of the alveolar ridge in the median line. Both the nasal and the oral opening of the incisive canal (*IC*) may be seen. The canal contains glandular tissue, blood vessels and nerves imbedded in loose connective tissue. On the labial surface of the ridge, the cut made during necropsy, to separate the outer facial tissues, was very close to the jaw. Therefore, in this particular specimen, the structures on the labial surface could not be studied and will have to be illustrated in a later figure taken from another specimen.

The alveolar ridge is composed of cancellous bone and is covered by a dense layer of fibrous connective tissue. From the crest of the ridge, the mucosa extends upward and backward toward the vault in a smooth even line. The incisive papilla (*IP*) appears lingually to the crest of the maxillary ridge. The palatine rugae that are commonly present are not found in this section. Posterior to the incisive foramen, the tissue between the bone and the oral mucosa consists of a thin layer of fat (*FT*) and fibrous connective tissue. Its thickness decreases toward the height of the vault.

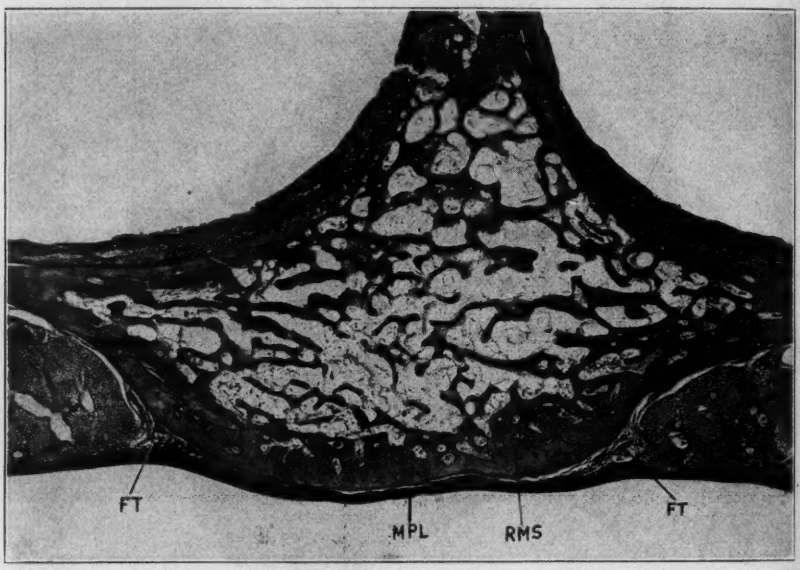

Fig. 15.—Higher magnification of central portion of Figure 13. *G*, glands; *FT*, fat tissue; *RMS*, ridge of maxillary suture; *MPL*, mucoperiosteal lining.

Figure 5 shows the posterior portion of the hard palate and its union with the soft palate. In the anterior portion of this area, the oral epithelium (*X*) lies

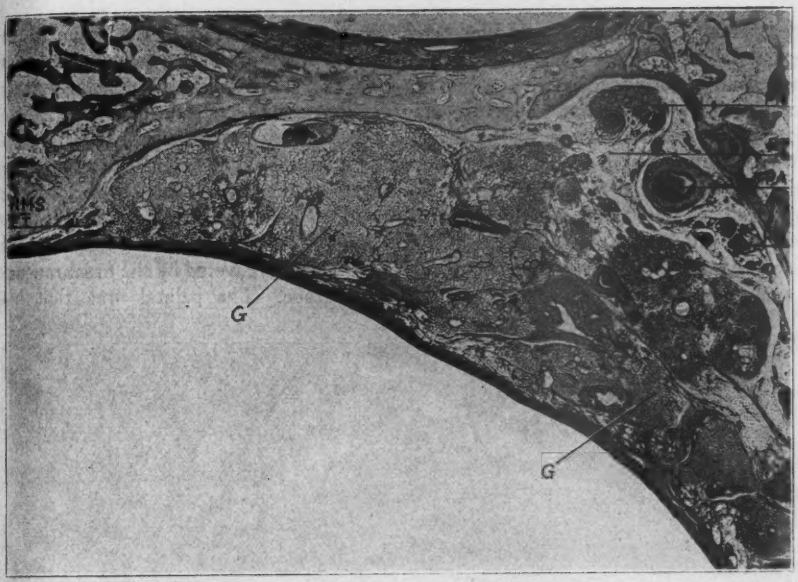

Fig. 16.—Higher magnification of area from Figure 13, between maxillary ridge and maxillary suture. *PN*, palatine nerves; *FT*, fat tissue; *PA*, palatine artery; *G*, glands; *RMS*, ridge of maxillary suture.

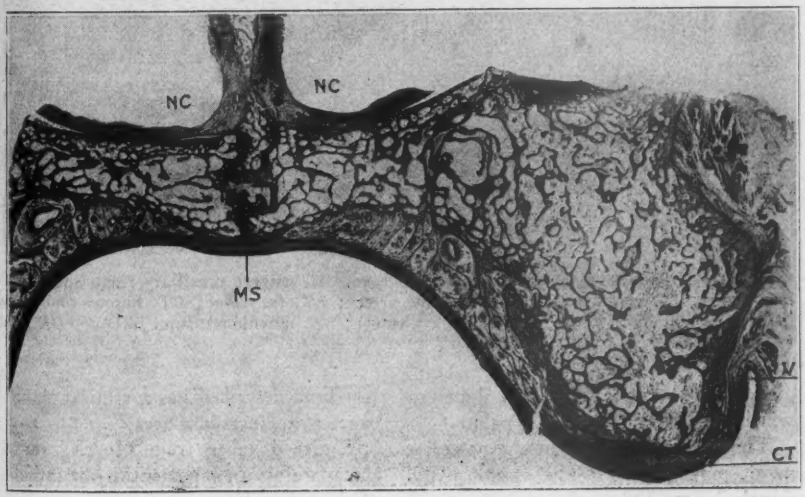

Fig. 17.—Frontal section through edentulous maxilla in region of second bicuspid. *NC*, nasal cavity; *MS*, maxillary suture; *V*, vestibulum (culdesac); *CT*, connective tissue covering residual alveolar ridge.

very close to the surface of the bony palate. There is only a very thin layer of unyielding fibrous connective tissue between the epithelium and the periosteum. Backward from the crest of the maxillary suture, the distance between the mucosa and the inferior surface of the palate bone increases steadily. At *FT*, a cushion of fat is present between the mucosa and the bone. Posteriorly to this adipose tissue, numerous large mucous glands are located (*G*), the ducts of which open through the soft palate.

The bony palate ends at the posterior nasal spine (*PNS*). The azygos uvula muscle is attached to the posterior nasal spine by an aponeurosis and forms a small bundle of fibers that extend downward on the posterior surface of the velum to the uvula. Beneath the azygos uvulae muscles (*AUM*), cross-sections of a large mass of muscle fibers may be seen. These fibers constitute the levator palati (*LP*) and palatopharyngeus (*PP*). The space between the fibers is filled with fat tissue richly supplied by vessels and nerves. The superior surface of both the hard and the soft palate is covered by the nasal mucous membrane. The palatal area that has just been described has a clinical significance as the postdam area.

Figure 6, taken from Morris,[5] shows the anatomic arrangement of the muscles of the soft palate.

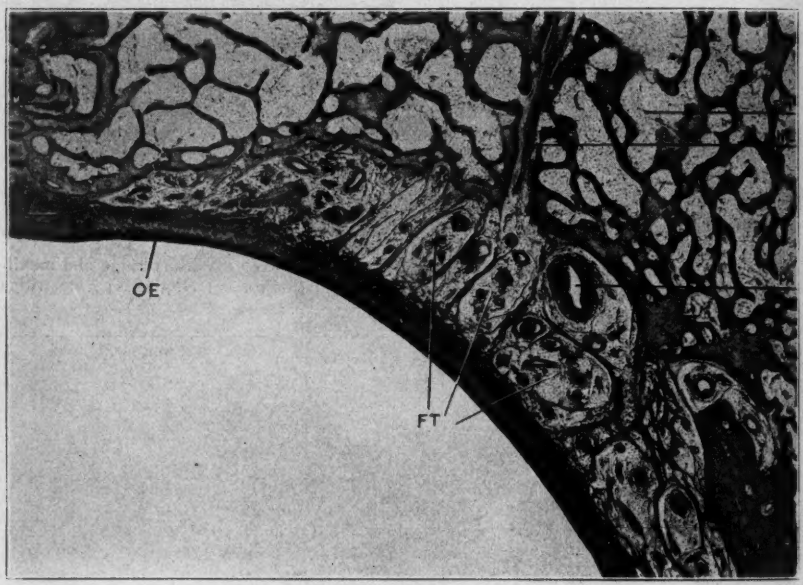

Fig. 18.—Higher magnification of area from Figure 17 between maxillary ridge and maxillary suture. *FM*, fat marrow; *PA*, palatine artery; *FT*, fat tissue; *CT*, fibrous connective tissue over maxillary suture; *MS*, maxillary suture; *NC*, nutritional canal in bone; *OE*, oral epithelium.

5. Morris, Henry: Human Anatomy, Philadelphia: P. Blakiston's Sons & Co., 1899.

Figure 7 is a higher magnification of area *X* in Figure 3 at the height of the vault. The oral epithelium is attached directly to the periosteum of the bony palate. (This condition is characteristic of the "area of relief" over the ridge of the maxillary suture.) A little back from point *X*, some fat tissue (*FT*) is found between the oral mucosa and the periosteum. This thin layer of fat is the dividing line between the relief area and the secondary stress-bearing area. Clinically, this line may be located very definitely as an area of perceptible compressibility extending entirely around the unyielding ridge of the maxillary suture.

Figure 8 is a higher magnification from Figure 3 of the structures immediately surrounding the posterior nasal spine (*PNS*), including the aponeurosis, muscle fibers and mucous glands. The secretion supplied from these glands keeps the palate moist and aids adhesion and valve seal of the artificial denture. Clinically, this region is very important. The denture base should extend posteriorly beyond the hard structures of the posterior nasal spine, upon the movable structures that are attached to the bone. The conventional form of the posterior border of the denture base rests upon the posterior nasal spine, instability, nausea and irritation of the mucosa resulting. (In Figure 2, a line drawn across the

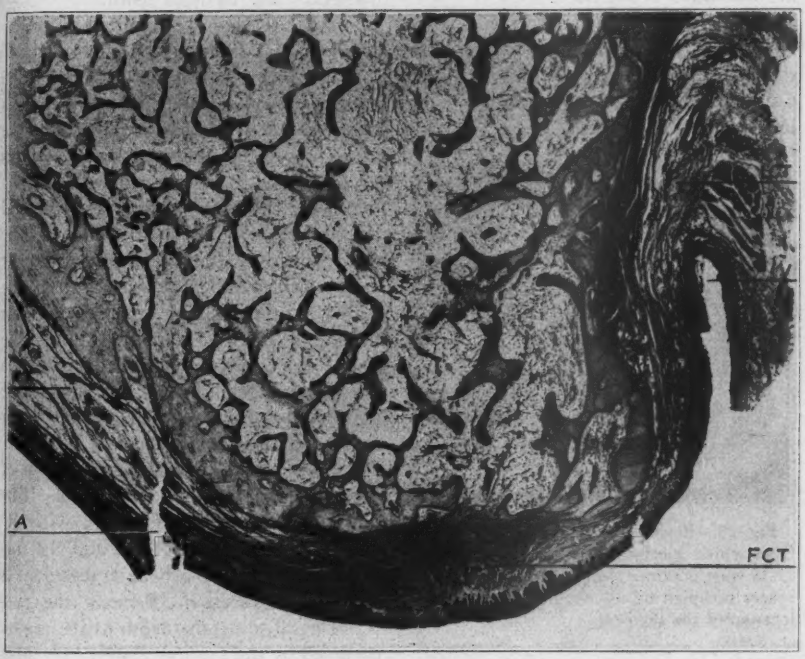

Fig. 19.—Higher magnification of edentulous ridge in Figure 17. *LCT*, loose connective tissue on buccal side of ridge; *V*, vestibulum; *FCT*, fibrous connective tissue on crest of ridge; *A*, artefact (cut); *FT*, fat tissue.

posterior border of the hard palate indicates the conventional outline of the posterior border of the maxillary denture.)

Figure 9 shows the arrangement of the muscles in the upper portion of the soft palate. There are the longitudinal fibers of the azygos uvulae (*AUM*) and the cross-sections through the bundles of the levator palati and the palatopharyngeus muscles (*LP, PP*). These bundles are imbedded in fat tissue (*FT*).

Comparing our study of the maxilla with what is known of other parts of the body, is it going a step too far to assume that the presence of the fat tissue in this area is of great clinical importance? One has but to refer to his clinical records to strengthen the assumption that in well-nourished individuals, presenting presumably a normal amount of adipose tissue, the mucosa is "succulent" and the valve effect of the denture constructed for these cases is favorable for retention. On the other hand, undernourished persons, particularly those suffering from a debilitating malady, present a clinical problem that is decidedly unfavorable. The tissues lack tone, their epithelial covering is dry and harsh and it is difficult to obtain a satisfactory retention.

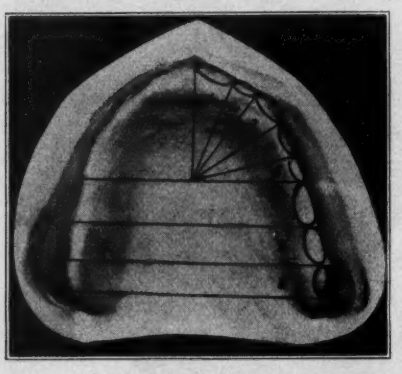

Fig. 20.—Plaster cast of edentulous maxilla from which specimens illustrated in Figures 21-36 were obtained. Numbers 1-8 indicate the spaces occupied by the natural teeth and the location of the segment.

The following series of pictures were made from a jaw in which a few teeth were present at the time of death. The sections were made in a buccolingual direction from the soft palate forward to the region formerly occupied by the maxillary first bicuspid tooth.

Figure 10 shows a buccolingual section at the posterior border of the hard palate through the posterior nasal spine. The posterior nasal spine (*PNS*) is seen as a triangular mass of bone at the base of the nasal septum between the nasal cavities (*NC*). The maxillary ridges form the lateral boundaries of this section, and the oral mucosa forms the floor. The pterygopalatine canals (*PPC*) may be seen between the cancellous bone of the ridges and the nasal cavity (*NC*). Large masses of mucous glands (*G*) fill the space between the ridges, which have a covering of fibrous connective tissue. The buccinator muscle is attached to the outer surface of the maxillae.

Figure 11 is a higher magnification of the central portion of Figure 10. The posterior nasal spine (*PNS*), with its compact outer layer of bone and the fat-marrow between the bone trabeculae, is seen in cross-section. Beneath the posterior nasal spine, the depth of the region occupied by the mucous glands (*G*) may be better understood by the operator because, in this picture, one is brought close to the compressible structures that may be found in the postdam area. It is regrettable that the oral epithelium was lost in the preparation of this specimen.

We see in Figure 12 a section made at the posterior portion of the maxillary tuberosity about 1 cm. forward of the section shown in Figure 10. The ridge of

the maxillary suture has a greater horizontal width and the proximity of the oral epithelium to the bone is evident. The mucous glands are confined to the triangular spaces between the maxillary ridges and the maxillary suture.

Figure 13 shows a section in the plane of the maxillary third molar. The area occupied by the mucous glands has been greatly reduced by the broadening of the ridge of the maxillary suture and the convergence of the maxillary ridges as the anterior portion of the maxilla is approached.

Figure 14 is a higher magnification of the maxillary ridge area of Figure 13. Our attention is attracted to the cancellous structure of the bone and the difference in the density of the inner and outer compact layers. This phenomenon was called to our attention in a recent article by Gysi in explanation of the decrease in the width of the maxilla as resorption of the bone progresses after the extraction of the teeth.

Fig. 21.—Labiolingual section through edentulous ridge near median line in area formerly occupied by upper central incisors (segment 1, Fig. 20). *ANS*, anterior nasal spine; *M*, muscle fibers; *LCT*, loose connective tissue on labial side of ridge; *V*, vestibulum; *MA*, muscle attachment; *MR*, maxillary ridge; *R*, rugae; *FT*, fat tissue; *IC*, incisive canal.

All the changes that occur in the maxillae following extraction of the teeth decrease the width of the maxillary arch and increase the width of the mandibular arch. This pro-

gressively increases the disparity between the arches. Immediately following extraction of the teeth, resorption begins at the margin of the alveoli and continues to a greater final extent than is generally appreciated. Because the changes in the form, size and position of the arches that result from this resorption are of great importance to the prosthetist, it will be well to make a brief study of its effects.

Whatever may be the actual process in resorption, its effects will be most easily understood if it is described under two headings, vertical resorption and lateral resorption. Immediately following extraction of the teeth, resorption begins in the direction indicated by the interalveolar crestline, as shown in the diagram, Figure 13.

At the same time, or later, resorption in the lateral direction begins. The form of the maxillary arch, together with the fact the maxillary molars have two buccal roots and only one lingual root, leaves a thin maxillary buccal wall after extraction, which is rather rapidly resorbed, and a thick lingual wall which is slowly resorbed.[6]

The crest of the maxillary ridge has a covering of fibrous connective tissue (*CT*). On the outer surface of the ridge, the buccal muscles (*BM*) attach themselves near its crest. At the lingual surface, a small area of fat (*FT*) may be seen between the fibrous connective tissue and the mucous glands (*G*). The vessels and the nerves which supply the palate are protected by this fatty cushion.

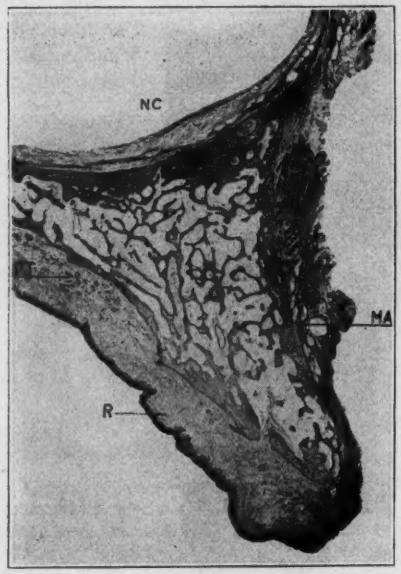

Fig. 22.—Labiolingual section through edentulous ridge in lateral incisor region (segment 2, Fig. 20.) *MA*, muscle attachment; *R*, rugae; *FT*, fat tissue; NC, nasal cavity.

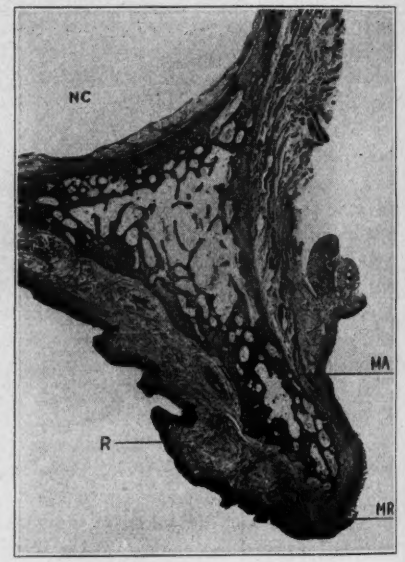

Fig. 23.—Labiolingual section through edentulous ridge in cuspid region (segment 3, Fig. 20.) *MA*, muscle attachment; *MR*, maxillary ridge with covering of fibrous connective tissue; *R*, rugae, *FT*, fat tissue; *NC*, nasal cavity.

Figure 15 is a high magnification of the central portion of Figure 13. The broad ridge of the maxillary suture

6. Gysi, Alfred: Special Teeth for Cross-Bite Cases, Dent. Digest, 33:99 (Feb.), 858 (Dec.) 1927; 34:18 (Jan.), 182 (March) 1928.

(*RMS*) has a thin covering of oral epithelium. At the border of this bony ridge (*FT*), a protecting cushion of fat lies beneath the epithelium and separates it from the mucous glands in the triangular space.

On clinical examination of the vault of the maxilla, this fatty area describes a compressible line at the lateral border of the palatal portion of the maxillary artificial denture should extend no farther than the circumscribed line. It should not extend on the area occupied by mucous glands (*G*). "An air chamber in an artificial denture is always injurious to the tissues and often a positive obstruction to the best retention."[1]

Figure 16 is a higher magnification

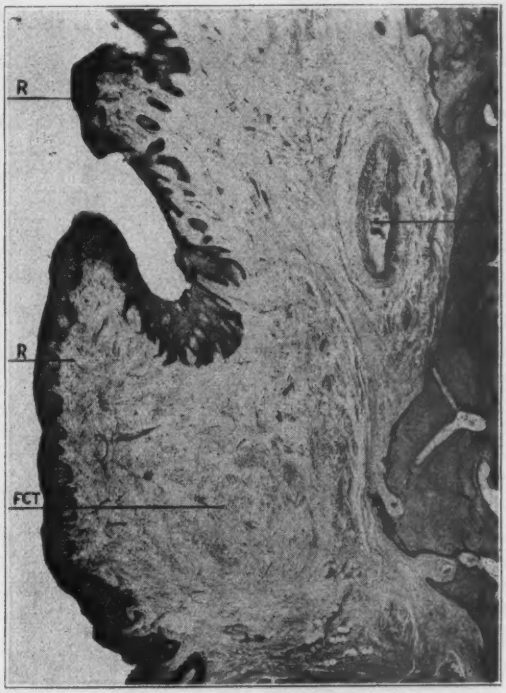

Fig. 24.—Higher magnification of lingual portion of Figure 23. *R*, rugae; *FCT*, fibrous connective tissue; *PA*, palatine artery.

the ridge of the maxillary suture and may be understood as the boundary of the area of relief. This boundary is an important clinical landmark. The relief area should occupy a definite circumscribed area. In order that a partial vacuum will not be created, the relief of

from Figure 13 of the triangular space between the maxillary ridges and the maxillary suture. The character and the distribution of the gland structure is well marked. The epithelial covering lies directly upon the mucous glands with no distinct submucosa. In the groove where

the palatal process of the maxilla joins the base of the maxillary ridge, the blood vessels (*PA*) and nerves (*PN*) are seen in cross-section.

Figure 17 shows a section through the region of the maxillary second bicuspid. The maxillary suture is well defined. In the triangular space, fat tissue has replaced the mucous glands that were found in the molar region. The thickness of the oral epithelium has increased. The general character of the bony structure of the ridge is more dense.

Figure 18 shows a higher magnification of the triangular space in Figure 17. Strands of fibrous tissue suspended from the vault divide the clusters of fat cells (*FT*) and are attached to the mucous covering of the palate. This region is richly supplied with vessels and nerves.

Figure 19 shows a higher magnification of the ridge area in Figure 17. The density of the outer and inner layers of bone may be noted. The cheek muscles folding over and forming the culdesac (*V*) present a well-defined area which accommodates the rim of the maxillary denture. This region is spoken of, clin-

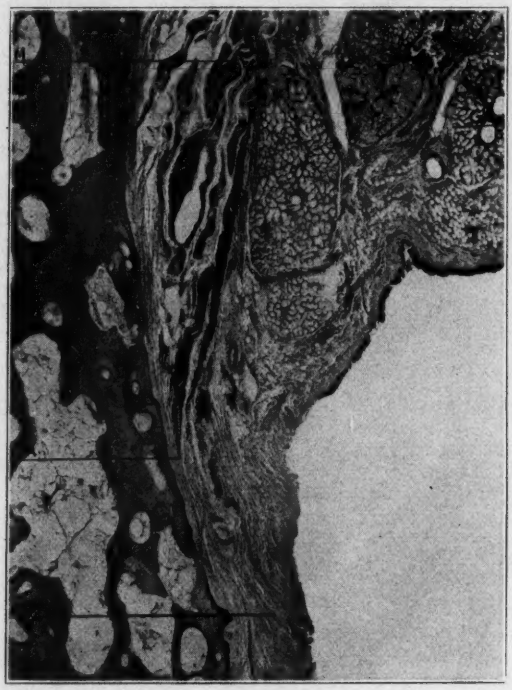

Fig. 25.—Higher magnification of labial portion of Figure 23. *G*, labial glands; *X*, boundary between primary stress-bearing area and valve-producing area; *FCT*, fibrous connective tissue; *MA*, muscle attachment; *M*, muscles of the canine fossa. (The labial muscle attachments extend below the vestibulum toward the crest of the maxillary ridge.)

ically, as the valve-producing area. It may be seen that these muscle attachments furnish a considerable area of elastic structure buccally to the ridge. These tissues are capable of folding over a denture rim and, by so doing, create a valve seal. The dense fibrous covering (*FCT*) of the crest of the maxillary ridge has been referred to clinically as the primary stress-bearing area.

In Figure 20, a plaster cast is shown

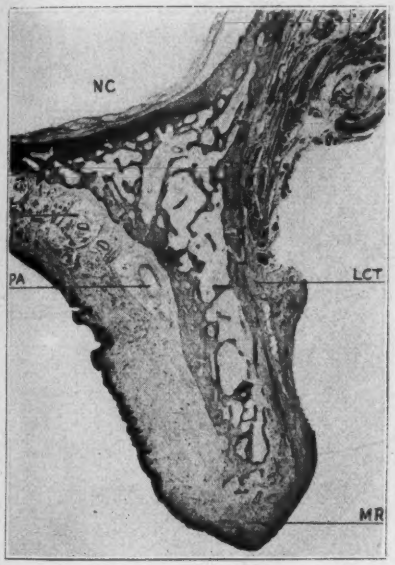

Fig. 26.—Buccolingual section through edentulous ridge in region of upper first bicuspid (segment 4, Fig. 20). *NC*, nasal cavity; *LCT*, loose connective tissue on buccal surface of ridge; *MR*, maxillary ridge; *PA*, palatine artery; *FT*, fat tissue.

which was produced from a plaster impression of the formalin-fixed specimen before decalcification of the maxillary denture area from a woman, aged 58. The cast was divided into segments corresponding to Black's average measurement of the mesiodistal width of the natural teeth. The division of the maxillary denture area enables us to refer to a segment of the jaw and so visualize its location. In the following description, these divisions are referred to as segments 1, 2, 3, etc.

Segments 1 to 3 inclusive show sections made in a labiolingual direction from the border of the specimen.

Segments 4 to 9 inclusive are frontal sections (buccolingual) across the plane of the specimen from the buccal border on one side through the vault to the corresponding surface on the opposite side. For example, a specimen from segment 6 would include the region formerly occupied by the maxillary first molar tooth. It includes the vault of the palate, the ridges and all of the structures intimately associated with them. A histologic section may be made from the mesial, central or distal plane of such a segment. It is interesting to observe the arrangement, distribution and association of the parts as the study is shown.

We will keep in mind that those studies of the specimens described up to this point were from men. The following sections were made from a woman about ten years older.

The female specimen presents a completely edentulous maxilla; those of the male specimens had some teeth remaining in the arches. The osseus framework of the male specimens was strong and compact; while the female presented a framework of a lighter structure. With a record of these individualities, it is noteworthy that the arrangement, distribution and location of a part found in one study is comparable to that found in another specimen.

Figure 21 shows a section of the maxillary ridge in the central incisor region (segment 1) at the median line through

the incisive canal. The labial plate of bone may be seen as less compact than the palatal layer. The muscles that are attached to the labial surface are inserted at the lower one-third of the maxillary ridge. Between the maxillary ridge and the muscle tissue, a thick layer of adipose tissue is seen. At the crest of the culdesac, at a point which would mark the inner surface of the upper lip, mucous glands are present beneath the mucous membrane.

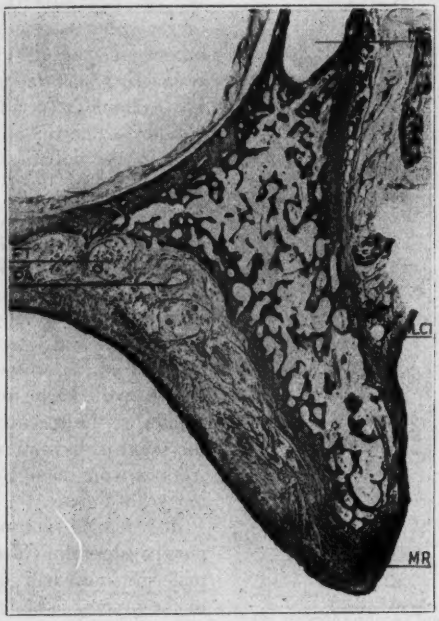

Fig. 27.—Buccolingual section through edentulous ridge in region of upper second bicuspid (segment 5, Fig. 20). *MS,* maxillary sinus; *LCT,* loose connective tissue on buccal surface of ridge; *MR,* maxillary ridge; *PA,* palatine artery; *FT,* fat tissue.

Fibrous connective tissue covers the lower one-third of the labial, the crest and the entire lingual surfaces of the maxillary ridge. The tissue covering of the lingual is notably thicker than that of the labial surface and has an irregular surface outline commonly known as rugae. On the lingual surface at the incisive canal, the maxillary bone appears more cancellous than the osseous structure in the region of the ridge. The beginning of the maxillary suture appears lingually to the incisive canal. At the upper border of this section, the nasal septum and the anterior nasal spine may be seen with their covering of nasal mucosa.

In Figure 22, a section through the region formerly occupied by the upper lateral incisor (segment 2) shows the labiolingual width of the maxillary ridge. It is somewhat smaller in this region. The

osseous structure appears very cancellous. The point of insertion of the labial muscles appears higher from the crest of the ridge than in the region of the central incisor. The labiolingual width of the muscle tissue is increased as the cuts are made farther from the anterior part of the arch. A marked contrast may be seen in the thickness of the fibrous covering of the ridge on the labial and lingual surfaces, the lingual tissue appearing many times thicker.

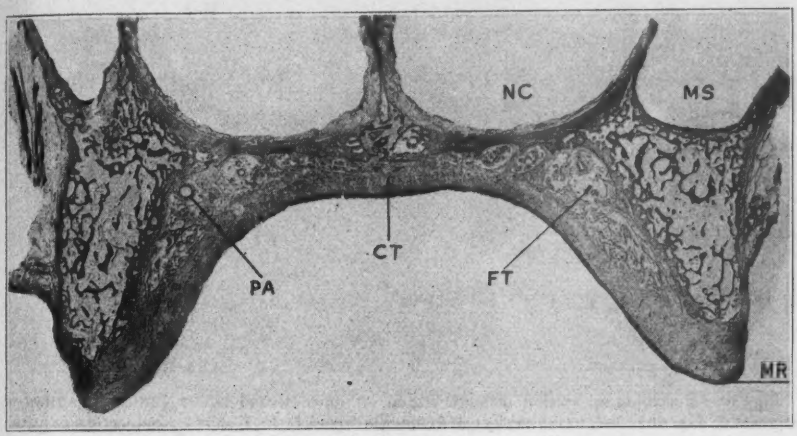

Fig. 28.—Buccolingual section in region of upper first molar (anterior portion of segment 6, Fig. 20). *NC*, nasal cavity; *MS*, maxillary sinus; *MR*, maxillary ridge; *FT*, fat tissue; *CT*, fibrous connective tissue; *PA*, palatine artery.

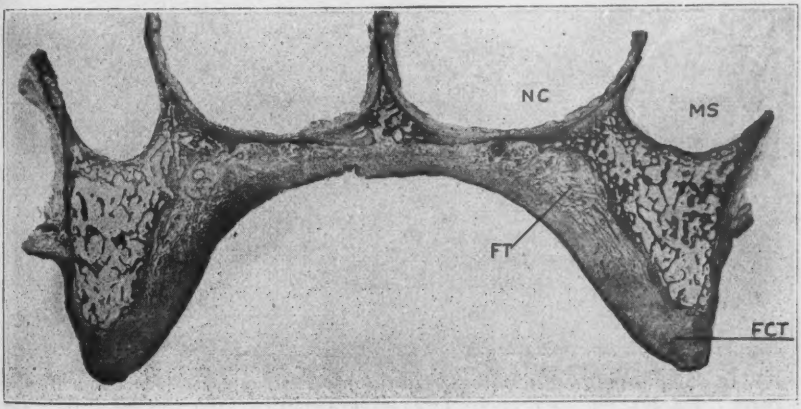

Fig. 29.—Buccolingual section in region of upper first molar (posterior portion of segment 6, Fig. 20). *NC*, nasal cavity; *MS*, maxillary sinus; *FCT*, fibrous connective tissue on crest of ridge; *FT*, fat tissue.

Figure 23 shows a section in the cuspid area (segment 3) and presents a rather

compact area of osseous structure. The inner cortical layer is markedly more dense than the outer layer. The labial surface of the ridge presents a concave

gual surface of the maxillary ridge is marked by highly developed rugae. A considerable amount of fat tissue may be seen on the palatal surface at the base

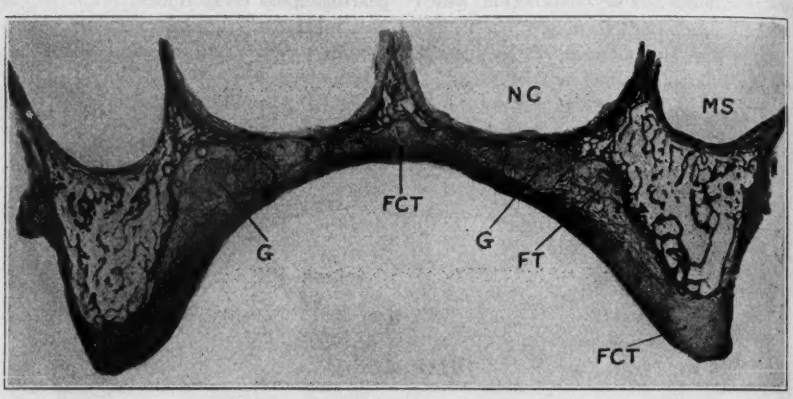

Fig. 30.—Buccolingual section through region of upper second molar (anterior portion of segment 7, Fig. 20). *NC*, nasal cavity; *MS*, maxillary sinus; *FCT*, fibrous connective tissue on crest of ridge and over maxillary suture; *FT*, fat tissue; *G*, glands of palate.

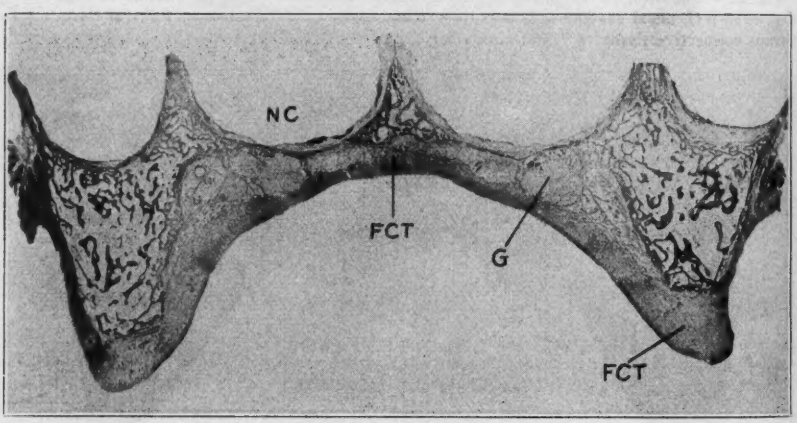

Fig. 31.—Buccolingual section through region of upper second molar (posterior portion of segment 7, Fig. 20). *NC*, nasal cavity; *FCT*, fibrous connective tissue on crest of ridge and over maxillary suture; *G*, glands of palate.

appearance from the body to the crest. The point of insertion of the labial muscles appears close to the crest of the ridge. The soft tissue covering the lin-

of the triangular area of bone, which is the base of the ridge.

Figures 21, 22 and 23 illustrate the region that has been referred to clinically

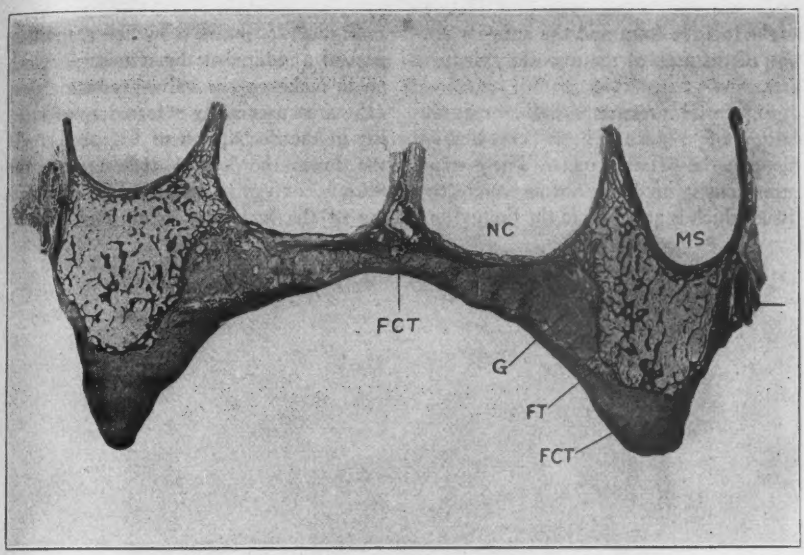

Fig. 32.—Buccolingual section through region of upper third molar (anterior portion of segment 8, Fig. 20). *NC*, nasal cavity; *MS*, maxillary sinus; *FCT*, fibrous connective tissue on crest of ridge and over maxillary suture; *FT*, fat tissue; *G*, glands of palate.

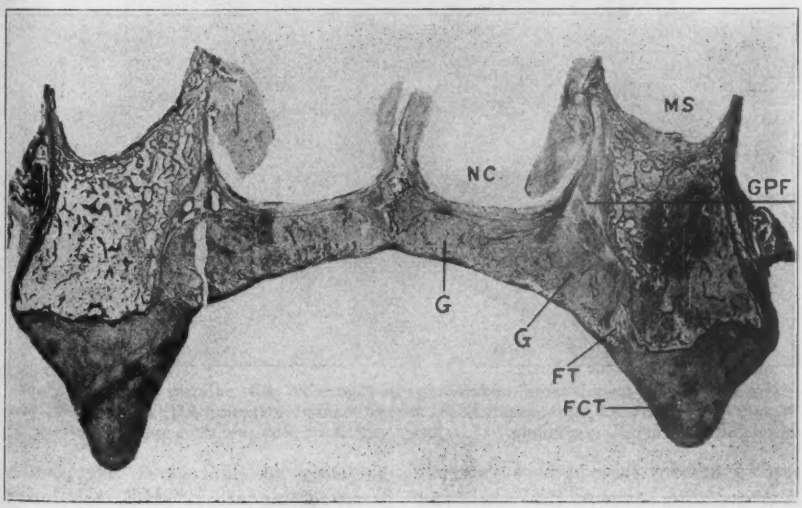

Fig. 33.—Buccolingual section through region of upper third molar (posterior portion of segment 8, Fig. 20). *NC*, nasal cavity; *MS*, maxillary sinus; *GPF*, greater palatine foramen; *FCT*, fibrous connective tissue on crest of ridge; *FT*, fat tissue; *G*, glands of palate.

as the incisive fossa and the anterior portion of the arch of the maxillary denture area.

Figure 24 presents a higher magnification of Figure 21 in cross-section through the palatal rugae. These structures consist of dense fibrous connective tissue which is attached to the lingual surface of the bony ridge by fibrous strands. A cross-section of the palatine artery may be seen in the upper half of the section, lying close to the bone and surrounded by fat tissue.

Figure 25 shows a higher magnification of a section of the structures which go to make up the valve-producing area (the area previously referred to as missing in the description of Figure 4). At the lower border of the section, the fibrous connective tissue (*FCT*) covering of the maxillary ridge may be seen (referred to clinically as the primary stress-bearing area). *MA*, the lowest point of insertion of the labial muscles, marks the clinical boundary between the valve-producing area and the primary

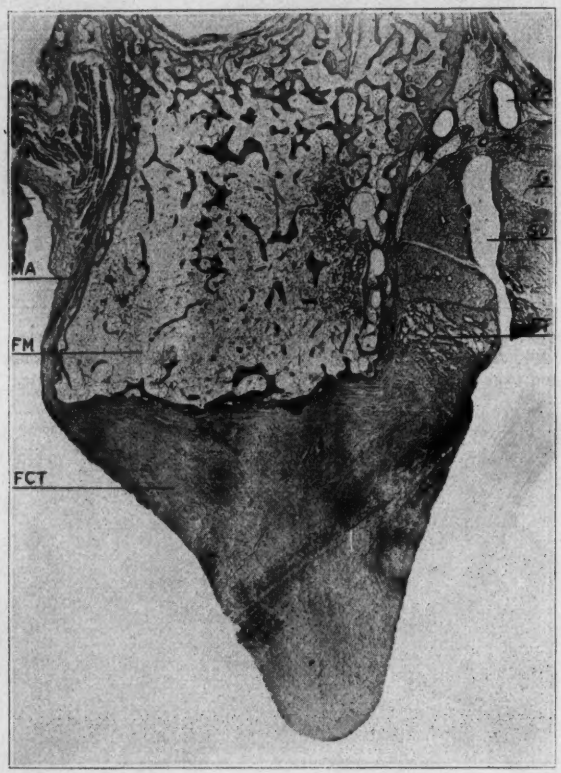

Fig. 34.—Higher magnification of left ridge of Figure 33. *PA*, palatine artery; *G*, glands; *SD*, secretory duct; *FT*, fat tissue; *FCT*, fibrous connective tissue; *FM*, fat marrow; *MA*, muscle attachment; *V*, vestibulum.

stress-bearing area. The structures that comprise the elastic tissue found on the labial surface of the maxillary ridge (incisive fossa) are composed of muscle fibers with a superficial covering of mucous glands, adipose tissue and the mucous lining of the lip.

overextended denture rim. It is evident that a technic which will produce a displacement of the peripheral tissue will not be successful. One may see clearly that vertical extension or horizontal widening of the denture rim may readily cause a failure to obtain an adaptation to

Fig. 35.—Higher magnification of right ridge of Figure 33. *BM*, buccinator muscle; *MA*, muscle attachment; *FM*, fat marrow; *FCT*, fibrous connective tissue; *FT*, fat tissue; *G*, glands; *PF*, greater palatine foramen; *MS*, maxillary sinus.

It does not require a vivid imagination to visualize the clinical possibilities of such structures as are present in this region. From the study of this microscopic picture, one can easily imagine an these delicate structures which will permit physiologic function.

Figure 26 reproduces a specimen from segment 4 in the first bicuspid region. Toward the crest of the maxillary ridge

(*MR*), the external layer of bone has only a thin plate remaining, while the internal layer is intact and quite firm. In this area, the muscles on the buccal surface are attached very near the crest of the ridge forming the buccal frenum. A dense fibrous connective tissue covers the crest and about two thirds of the lingual surface of the ridge. At *PA*, a ginning of the maxillary sinus (*MS*). The muscle attachments on the buccal surface of the ridge are nearer the crest. The fibrous covering of the ridge is thin. The lingual one-fourth and the crest of the ridge show a covering of fibrous connective tissue. The triangular space occupies about three fourths of the area lying lingually to the ridge. Near the

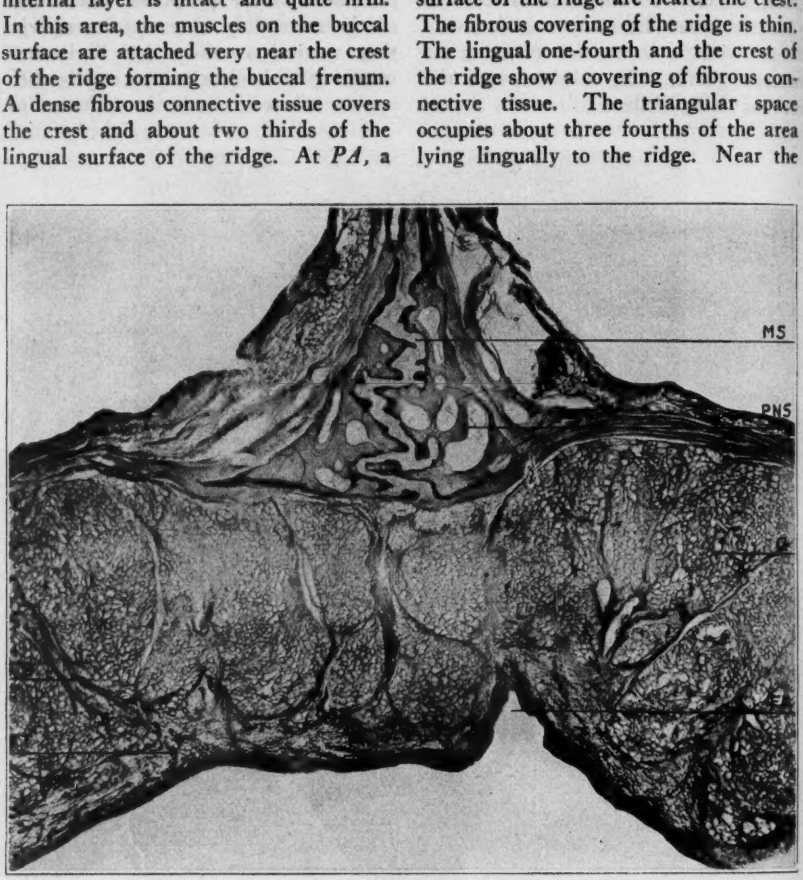

Fig. 36.—Frontal section through posterior nasal spine (postdam area). *MS*, maxillary suture; *PNS*, posterior nasal spine; *G*, glands; *FP*, foveola palatina; *FT*, fat tissue; *FB*, fiber bundles.

large palatal artery is seen. The fibrous tissue becomes less dense as the base of the ridge is approached and the encapsulated areas of fat tissue form a cushion beneath the fibrous layer.

Figure 27, segment 5, shows the base of the ridge is a considerable amount of adipose tissue (*FT*).

Figure 28 presents a frontal section including the vault and both maxillary ridges, the nasal cavity (*NC*), maxillary sinuses (*MS*) and maxillary suture. The

zygomatic process presents a compact layer of bone to which the buccal muscles are attached. It has been referred to as a clinical hazard. The section was made at the maxillary first molar, an anterior plane of segment 6. This specimen presents a very thick covering of fibrous connective tissue over the vault and ridges. Such a clinical condition is sometimes referred to as being associated with a heavy or thick submucous structure. Beneath the fibrous tissue (*FCT*) covering of the vault large areas of fat tissue (*FT*) occupy the triangular space between the ridge of the maxillary suture and the maxillary ridge. The buccal muscle attachments are near the crest of the maxillary ridge.

Figure 29 presents a posterior plane from segment 6. In the short distance between these two sections (Figs. 28-29), a change may be seen in the form of the ridge of the maxillary suture. Beneath the ridge of the maxillary suture, the adipose tissue is more abundant. Mucous glands appear in the adipose tissue.

Figure 30 shows a section through an anterior plane of segment 7. Definitely divided areas of fibrous connective tissue, fat cells and glandular tissue may be seen. The fibrous connective tissue (*FCT*) is confined to the ridge area and to the maxillary suture (*FCT*). The adipose tissue (*FT*) protects, as a covering, the vessels and nerves on the lingual surface of the ridge. Mucous glands (*G*) are present in the triangular space between the maxillary suture and the ridge.

Figure 31 is a posterior section of segment 7 (second molar region). An increase is noted in the depth of the culdesac on the buccal surface. The fibrous connective tissue is less dense near the vault. The glandular area is somewhat increased in size as the cuts are made nearer the velum. There is very little adipose tissue except that surrounding the vessels and nerves. The width of the ridge of the maxillary suture is reduced in size.

Figure 32 shows a plane of segment 8 in the third molar region. The triangular space is occupied by mucous glands. Only a small area of fat is seen lingually to the crest of the ridge, and this surrounds the vessels and nerves of the palate. A pendulous area of fibrous connective tissue covers the right maxillary ridge. The distribution of fat and glandular tissue presents a similar picture to the one seen in Figure 13.

Figure 33 is a section of segment 9, at the posterior border of the tuberosity. A change is noticed in the form of the maxillary ridge. It appears as a block formation, and its osseous structure is extremely cancellous. A pendulous area of fibrous connective tissue covers the ridges. Lingually to the crest of the ridges, a deposit of adipose tissue divides the area of fibrous tissue and the triangular spaces. An increasing area of mucous glands is seen as the region of the soft palate is approached. At the right, a large duct leading from the palatal glands opens through the epithelial covering of the palate. A superficial layer of adipose tissue lies between the oral epithelium and the mucous glands.

Figure 34 is a higher magnification of Figure 33, showing the right tuberosity region. Here we have a "close-up" of the mucous glands in the triangular space with the cross-section of a duct from the glands. The palatine arteries are seen lying sheltered in the pterygopalatine canal surrounded by adipose tissue.

Figure 35 shows a higher magnification of the left tuberosity region of Figure 33. There is a diminution in the form and structure of the pendulous area

of fibrous connective tissue which covers the ridge in this region (*FCT*). The form of the culdesac and the attachment of the buccinator muscle to the outer surface of the maxillary ridge is seen at *BM*. The adipose tissue (*FT*) has consistently presented itself lingually to the crest of the ridge between the primary and the secondary stress-bearing area. *MS* indicates the maxillary sinus; *G*, the palatal glands, and *GPF*, the greater palatine foramen, which shelters the vessels and nerves that are found always protected by an abundance of adipose tissue.

Figure 36 shows one of the most interesting of our studies. It presents a higher magnification of a frontal section of the postdam area. The section was made just at the union of the hard and the soft palate. *MS* shows the maxillary suture, *PNS*, the posterior nasal spine; *FP*, the foveola palatina; *G*, the mucous glands; *FT*, the adipose tissue, and *FB*, strands of fibrous connective tissue attached to the hard palate, holding in suspension the glands and oral epithelium.

SUMMARY

1. The edentulous maxilla has been divided into four areas for clinical description. These areas are referred to collectively as the maxillary areas of retention, or denture areas. The components are: primary stress-bearing area, the relief area, the secondary stress-bearing area and the valve-producing area.

2. The denture areas and the border line between the components may be quite definitely determined by clinical examination. Each area should be so utilized that it may accomplish a particular purpose in the scheme of full denture retention.

3. The histologic sections were made in several vertical planes through the edentulous maxilla. These sections included the hard and soft tissues and made it possible to recognize the different clinical areas by a certain well-defined distribution of these tissues.

4. The primary stress-bearing area is characterized by the presence of a dense layer of fibrous connective tissue covering the bone of the maxillary ridge.

5. The relief area is recognized by the extremely thin and unyielding layer of soft tissue over a definitely circumscribed area of the bony ridge of the maxillary suture in the median line.

6. The secondary stress-bearing area, a region of equalization, forms a neutral zone between the areas of relief and of primary stress.

7. The valve-producing area is represented by the attachment of the labial and buccal muscles at the outer border of the maxilla and also of the structures of the soft palate in the postdam region.

8. Three maxillae of persons of different age and sex, on histologic examination presented the same basic arrangement and distribution of the tissues.

9. A definite plan of operation may be adopted when it is possible to locate the areas of retention by clinical examination.

10. In the science of dentistry, as well as in medicine, a knowledge of the normal structure is necessary to the successful termination of any clinical procedure.

PROFESSIONAL SERVICE VERSUS SALESMANSHIP*

By R. J. RINEHART, D.D.S., F.A.C.D., Kansas City, Mo.

WHEN I was asked to read a paper before this Section, my thought centered immediately on the precarious position in which the prosthetic branch of our profession finds itself because of three factors in its practice: (1) salesmanship; (2) the commercial laboratory, and (3) the use of trade names. The subject of economics and likewise of dental economics enters into this discussion.

At the height of the greatest prosperity of all times comes a sudden extended devitalizing depression, and everywhere the question is asked, "What is the matter with business?" The first answer given us was: "Overconfidence in the stock market." Stocks were too high, it was argued, so they must fall; they were selling beyond their value; there was too much gambling. Then, as conditions grew more stagnant, the economists brought out of the argument regarding overproduction. I have listened to many lectures by purported authorities on the subject, but few of them agree, and each succeeding downward step in the depression has brought out a different idea.

We are beginning to hear considerable discussion about the public's being oversold. Business acceleration and achievement have not all been based on supply and demand, but, to quite an extent, on highly developed specialization. "Quota" is a term applied to distribution through salesmanship. By way of illustration: Insurance companies open many offices with managers and salesmanagers in charge. They employ salesmen, train them to a highly technical degree in the art of salesmanship and assign them a territory; and a certain "quota" of business is expected from that assignment.

These organizations from the home office down have gone at high speed in developing the art of high pressure salesmanship since it made it appearance about nineteen years ago. This process is used to distribute practically every commodity on the market today. Insurance, automobiles, pianos, phonographs, radios, etc., are all sold by quota stipulation. As a result, every wage earner is burdened with installment payments, and the money has gradually been piled up in the laps of the large corporations. This fact is being realized by the public today.

The professions have felt impelled to keep step with the times and a great change has thus taken place in their business tactics. Dentistry and medicine have become highly specialized, and in order to keep the specialists going, much high pressure salesmanship is being employed; I dare say, entirely too much for ethical standards and future success.

But now a readjustment is taking place. Those who sit and wonder when the depression is going to pass will be sitting a long time if they expect a return of the prosperity of postwar days. Will

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business improve? Of course, it will. It always has and always will change for the better after a decided depression, but of necessity it will be on a different basis. Extreme prosperity is a dangerous condition because the fall is hard and no one is willing to accept the change. We have become accustomed to buying everything that is presented to us with highly colored sales talks.

A questionnaire sent to approximately 3,000 citizens of all classes gave a majority opinion that the real cause of crime was madness for money caused by commercialization in all of life's activities.

The quota system came into vogue with the automobile. Today, business of all kinds is in the habit of dictating to the public what it must buy and the public has taken it for granted that it must buy. Commercialized courses in salesmanship are offered everywhere and every business has its individual course for its employes.

Please let me assure you that I am not advocating economic apathy, nor do I wish to discredit or minimize the importance of dental economics, although I have ideas quite different from some on that subject. I agree that we need instruction in economics, but we need first to understand what economics is. We need more instruction in the subject of professional service. A professional man needs to study values, the value of money and commodities as well as time and service. He needs also equalization of his fees. He needs instruction in savings and investments. All instruction is not going to be heeded. Speculation and adventure is in the blood of many, but the wise will profit, and the substantial element of the profession can steady the boat, becoming an example and an inspiration to the younger members who enter the profession.

Let us consider the item of laboratory service and expense: Every student in the colleges has been trained in all technical procedures. They are all qualified to prepare the mouth of the patient for dentures, full and partial, take impressions, survey and outline the case and carry it through to completion. But what is happening? I believe that the greater percentage of dentists send everything to the laboratory that it is possible for the laboratory to handle. The laboratories today believe that the dentist is absolutely dependent on them. Moreover, the laboratories believe that they know more than the dentists do about prosthetic dentistry. They do not hesitate to say so. Some dentists call in a laboratory man to take impressions. What thought is left with the patient? When the patient pays the bill, what does he think? He knows the laboratory did the work and he also knows that he is paying a middleman a generous profit. This is salesmanship in dentistry and nothing more. It is not a professional service: it is plainly a technician's service, and the dentist is the salesman.

From an economic standpoint, what is the answer? If this is dentistry, the public should be sent to the laboratory. But, fortunately, it is not a considerate service, although it is to be admitted that some laboratory men have acquired a fair knowledge of dentistry as touching the mechanical side. But what does he know of anatomy, physiology, bacteriology and pathology? All of which form the basis of diagnosis preliminary to denture service and a knowledge of which is necessary for proper impression taking and denture construction, and also as a basis of advice to the patient

and the care of the mouth after the denture is inserted.

A dentist whose time is not fully occupied with appointments can pay his overhead by doing his own laboratory work. A successful business man avails himself of every opportunity as touching his own business. Some teachers of dental economics contend that the dentist cannot afford to do his own laboratory work. In my opinion, this is not sound instruction. Of course, a good laboratory technician is valuable to the busy man, just as a good chair assistant is valuable.

If the volume of business does not justify the employment of a laboratory assistant, the commercial laboratory is available for strictly mechanical procedures when rush of business demands help. Diagnosis and designing of the work are the duty of the dentist. If he finds that he is not qualified, it is important that he should take additional training.

The use of trade names also has a part in the unwise methods in use today. This, which enters into the salesmanship methods used by many dentists, opens wide the door to shoppers. If dental economics means high pressure salesmanship, I cannot be in sympathy with so-called dental economics.

Prosthetic dentistry is not the only branch of our profession in which too much salesmanship is used. The very foundation of our practice, which is diagnosis, is used to "high pressure" the patient. "Throw the scare into them" is an expression I have heard, and this is frequently done to a damnable degree. Patients must be correctly advised as to existing conditions after a thorough investigation and study of the case, but surely with sympathy, kindness and honesty.

If the dentist is not to "sell" his service and use all of these crafty methods in order to "put himself over," what is he to do? This was a question put to me by a young man recently, after I had counseled with him concerning certain of his methods which were contrary to his scholastic instruction.

The answer is really so simple that we should not be compelled to argue the question. To instruct the people in preventive dentistry and render an honest service is a system that cannot fail to build a substantial practice provided the dentist has or develops an agreeable personality and conducts his office in line with modern ideals. Selling dentistry from the standpoint of materials is accountable for the low appraisal of the dentist's service by so many patients. The origin of this error antedates dentistry as a profession many years, when it was mainly in the hands of the uneducated and the unscrupulous. Dentistry as a branch of medical science was cast aside by the medical profession, and it remained for those especially interested and working in the specialty to foster and promote the service. For ninety years, a great army of sincere, conscientious workers in the profession have been busy with problems in research and education, all for public welfare, as well as for the elevation of their chosen vocation.

Dentistry has in the past decade become the first consideration in medical diagnosis in more than 50 per cent of physical complications. This fact is demanding much of the dentist, and it also demands a closer cooperation and brotherly understanding between the professions.

There is a small group who are proposing to eliminate dentistry as a profession and make it a specialty of medicine after the M.D. degree has been con-

ferred. The graduate then would be a diagnostician and an overseer of technicians. The present adequate service of dentistry is due to its independence as a profession, and if dentistry is to continue to progress, it must remain independent. If the technics are ever separated from the basic sciences, history will repeat itself.

A dentist on a university hospital staff recently heard a conversation between members of the medical teaching group. One of them spoke of dentistry as one of the problems of the medical profession. He was answered by another member of the group who said that Germany had the right system, that dentistry should be in the hands of the medical profession, where it rightfully belonged. He said that in Germany the physician took care of all the soft tissues of the mouth, made the diagnosis and recommendation for dental work and wrote a prescription, which was sent to a dental technician. An analysis of that statement would lead one to believe that the physician considered members of his profession more sincere than those of the dental profession. Certainly, he did not mean that they were better qualified to make a diagnosis in dentistry, as there is very little taught in the medical schools concerning the teeth, and the dental profession has had ninety years of educational background.

It is true that there is a wide disagreement between the two professions regarding dental roentgen-ray interpretation. The dental profession has had extensive training in dental roentgenology and in diagnosis of mouth conditions. Only in recent years has the dentist and the physician given serious consideration to pathologic conditions of the mouth as affecting the entire system. Closer cooperation between the two professions is necessary, but many physicians need a broader understanding of dentistry in order to cooperate intelligently with the dentist. Some physicians, when making a physical examination, take a casual glance in the mouth and, seeing gold reconstruction work, order the teeth extracted.

If this were to be considered the final conclusion, all branches of dentistry except prosthetic might as well be abandoned. Fillings in teeth are just as questionable as a crown properly fitted. Fortunately all physicians do not make their diagnosis in this fashion, but are willing to cooperate with the dentist, leaving it to his judgment as to whether the reconstruction work in the mouth is a menace or not. There are those physicians who condemn the gold restoration, believing the system of preparation and construction to be the same as before the discovery of focal infection. They surely do not realize that modern methods leave the teeth vital, that the crowns are accurately fitted and that it is not the metallic crown that is at fault.

In a recent lecture to both professions in Kansas City, Joseph Colt Bloodgood spoke enthusiastically for cooperation and a better understanding. Generally speaking, he said, both professions need an expanded knowledge of the pathology of the mouth. He stated that the dentist should begin his roentgen-ray survey with the children who come to his office. He called the dentist's attention to the fact that a smear for diagnosis of infection took only a few minutes and should be a part of routine practice. A specimen of pathologic tissue of the mouth should be obtained and sent to the laboratory. "Acquire the habit of using the pathologic laboratory," was his advice.

A better understanding between the professions is one of the immediate prob-

lems; but through all the 3,000 years of the history of medicine, it failed to give any particular importance to the teeth, and of the medical schools, at the present time, only fourteen give any definite instruction concerning the teeth. Now that dentistry is giving to the public an adequate service and its importance has been thoroughly established, there are those members of the medical profession who would like to claim it. Dr. Gies of the Carnegie Foundation, after making an extensive survey of dentistry in America and Canada, states, in Bulletin No. 19, that dentistry has already come to be known as an oral specialty of medicine, and he advises strongly that it remain an independent profession. The continuance of dentistry as now constituted depends on the wisdom of its members.

If high pressure methods go too far and the laboratories become too authoritative, we may expect radical changes not at all agreeable to our present practitioners.

"I sold a patient a dentures" is a frequent statement. This type of conversation between members of the profession is in itself establishing commercialism in the minds of those engaging in such conversation. This has a tendency to lower standards in one's own mind. A set of teeth is not a commodity: it represents a service.

Selling professional services is a paradox. The term "sell" used as an end-result of a consultation and diagnosis is lacking in exactness and dignity. "To sell" means to extol something as being better than a similar thing or to barter, vend, trade or transfer a thing to another, receiving money in return. Of course, a gold denture may be better than a vulcanite denture, but creating a demand for any professional service should be accomplished through instruction and honest advice, the constructive and efficacious method. Many of the younger members of our profession are enamored with the idea of an easy method of practice and with it a large income. Salesmanship and quota seem to be the basis of many practices today, rather than a sincere interest in educating the patient.

Youth is credulous because of its lack of wisdom and experience, but credulity is not by any means confined to youth. The stealthy tendency toward commercialism is the foe within. The subject of dental economics should not be confounded with commercializing methods. Economics deals with supply and demand. It is the art of successfully managing and properly setting one's affairs aright according to income and expense.

Public education and patient education are related to economics. Salesmanship as an art has no relation to economics as a science. Salesmanship in commercial business today is often only "high pressure." To render a service is the performance of labor for the benefit of another, duty done or required or official function. The demand for professional service comes not by sales talks, crafty methods, advertising or extolling of materials, trade names or prices, but by teaching.

A recent interview by a committee of dentists with a representative of a large newspaper concerning dental advertisements in the paper revealed the fact that members of the newspaper staff looked on a set of teeth or a bridge as a commodity, such as an automobile, a radio or a suit of clothes, and pointed out in a display advertisement the various items listed at certain prices and a description of materials as evidence that there must be a standard of materials and methods

used by all dentists. Why not let the public know these things by advertising?

The newspaper representative seemed amazed to hear of the relation of health to a bridge or set of teeth beyond its masticatory function.

The degree of doctor of dental surgery authorizes one to be a teacher, a teacher in a "holy sanctuary" known as a dental office. A dentist is a teacher of hygiene, the preservation of health and the prevention of decay, as well as of methods adequate to reestablish normal function or as nearly so as conditions will permit. Materials are a secondary consideration, and if they are not so considered, the dentist is prostituting his position, and competition becomes certain. Dentists are not competitors, but a real competition, created by the dentist himself, may arise in the future from the encroachment of outside craftsmen.

The age is fraught with greatness and equal dangers. It is well to reflect on the old saying that "history repeats itself." We do not desire to return to conditions outgrown. An evil day is set aside only by the heeding of wisdom. Professional lore is to be found with those members of our profession who are rendering an honest service created by teaching and doing.

The dentist, physician and others of the recognized profession have nothing to sell. Their services are in demand because of their reputation. The permanent practice demanding substantial fees has been built upon a firm foundation. A professional reputation is created because of the ability to educate, to advise and to do. A beginner's reputation rests in the fact that he has been graduated and granted a license to practice, that he conducts himself properly, which includes introducing himself ethically, gives instruction in prevention, advises honestly and renders an adequate service.

CAVITY PREPARATION AND INLAY CASTING*

By EMORY O. WEST, D.D.S., Des Moines, Iowa

IN considering cavity preparation for the cast gold inlay, the same principles will be followed as those set forth by the late G. V. Black. It is quite obvious that those attempting cavity preparation should have a thorough knowledge of the structural elements of the enamel and dentin and of the anatomy of the pulp.

Haphazard cavity preparation is perhaps the commonest cause of failure of the restoration, no matter what filling material is used.

In the preparation of cavities for inlays, the same fundamental principles are followed as those of general cavity preparation. In this brief review of cavity preparation, Class II cavities will be considered.

In studying the outline form, we should have a mental picture of the area of tooth surface to be included within the enamel margins of the finished cavity. The cutting of these lines is the first

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thing to be considered and accomplished. In this procedure, the cavity margin is extended to an area close to the angle, buccal and lingual. This is usually an immune area, or an area less liable to decay, which will be cleansed by the excursion of food during mastication. It is very seldom necessary to extend the cavity beyond the axial angles unless the tooth is in malposition.

Resistance form is the shape given to a cavity which will best afford a seat for the filling to withstand the stress of mastication. It should be at right angles to the force of stress exerted, or, usually, at right angles with the long axis of the tooth. With inlay cavity preparation, good resistance form constitutes a large part of the retention form. This is in the form of a flat seat or floor. In the preparation of cavities for bridge abutments, there is a greater need for better resistance form.

The retention form is the form given to the cavity to prevent the displacement of the filling by the tipping forces that may be brought against it. For inlay cavity preparation, it is not permissible to have the slight undercuts that we have in general cavity preparation. The retention, which is usually in the form of a dovetail, should extend into the developmental grooves toward the buccal and lingual margins. Some operators choose to use small pins as an added means of retention.

The convenience form is accomplished by having the cavity walls slightly divergent, in a degree to safely remove the wax pattern without distortion or breaking. This is a most important step, as any slight undercut may cause the wax pattern to be slightly distorted in removal, and hence the inlay will not fit the cavity. Lack of serious consideration regarding the convenience form of cavity preparation for inlays is no doubt responsible for the failure of many restorations to fit.

At this stage of cavity preparation, there will be little or no carious dentin remaining. If a small amount of carious dentin remains in the cavity, it should be removed, and the undercuts should be filled with cement so that the cavity will shed a wax pattern without distortion. If the undercuts are large, usually a reconditioning of the cavity is necessary.

The finish of the enamel wall is closely associated with the convenience form. The cutting of the enamel in carrying out the convenience form usually leaves a strong enamel, and there is little left to do except the beveling of the cavosurface angle. The purpose of the beveling of the cavosurface angle is to cut away any loose ends of enamel rods that might afterward fall away and leave an imperfect margin. The beveling is effected with a chisel, enamel hatchet and gingival margin trimmer. Tapered stones are very effective in accomplishing the beveling of the occlusal portion. The buccal and lingual walls of the proximal portion are now disked with true running cuttlefish disks. The reason for doing this is that it will produce a very smooth cavity wall. The cavity should now have a definite clear-cut bevel throughout the entirety so that when the wax pattern is taken, it will show a well defined bevel in the wax.

In the removal of a number of inlays, both from the mouth and from extracted teeth, it is surprising to see the great number in which no attempt was made to effect a bevel of the cavosurface of the gingival wall. This alone foretells failure of the restoration in mouths of average hygienic condition. For those who wish to familiarize themselves with the principles of cavity preparation, it would be well to prepare cavities in a large num-

ber of extracted teeth, plaster teeth and porcelain teeth.

In the principles of cavity preparation, it is the neglect of details that very often is the direct cause of undesired results when the inlay is placed in the cavity. There has been much said about the contraction of gold as an outstanding cause of the poor fit of inlays, but it is a known fact that all the schematic procedures of the casting process will not compensate for poor cavity preparation. Proper cavity preparation cannot be too strongly emphasized.

Viewing another aspect of inlay failures, especially bridge abutments, we are prone to pass hasty judgment in our own minds as to the type of restoration to be used. In the mouth extremely susceptible to caries or one negligent of mouth hygiene, we have seen large inlays and three-quarter crowns a failure, not because of the restoration itself, but because of the unclean condition and the occurrence of further decay. In such cases in the posterior part of the mouth, is it not better judgment to place a well-fitting banded crown, or, better still, to make a full cast crown for the restoration?

In securing a wax pattern, it is necessary to keep in mind the characteristics of wax: expansion on heating, contraction on cooling and elasticity while warm. From a properly prepared cavity, we must have a well-adapted wax pattern or the restoration will be a failure. In all compound approximal, three-quarter crown, full crown and large Class II cavities, it is difficult to control the flow of wax unless a matrix is used. The following systematic procedure may be used in securing the wax pattern.

1. Fit the matrix around the tooth so that it slides on and off easily. Trim the occlusal end of the matrix so that the patient may close in centric relation without striking the matrix.

2. Heat the wax in an open flame, being careful not to melt the surface. Mold it between the thumb and finger and work it into the desired shape. Fill the matrix, leaving the more firm portion of wax in the occlusal end of the matrix to serve as a plunger.

3. Place the matrix on the tooth and press it gingivally with heavy thumb pressure. Have patient close in centric relation. Ask the patient to open, placing a small piece of rubber dam on the wax, and to close again. Maintain this pressure for one or two minutes.

4. Chill the wax with cold water or air and carve the occlusal portion without removing the matrix. As long as the matrix is in place, the operator has complete control of the wax.

5. Release the matrix and finish the buccal and lingual margins with wax carvers. A large portion of the surplus wax at the gingival is removed with wax carvers.

6. Remove any excess wax at the gingival margin with fine cuttlefish strips and silk taffeta tape. The tape will burnish the margins so that a very smooth pattern can be had.

7. Mark the position of the contact point on the marginal ridge of the wax pattern so that it can be added after the pattern is removed.

In placing the sprue, it is better not to insert a heated pin in the wax pattern, but to add a small amount of wax at the desired point and attach the pin into it. By pressing the heated pin into the wax pattern, we invite another hazard of distortion. It is best to place the sprue at a point somewhere near the center of the pattern, thereby giving the gold a more equal flow when casting. Wax patterns should not be allowed to remain any length of time before being invested. By placing the investment upon the wax pattern, any changes that otherwise might take place will be eliminated.

The sprue pin is now made fast to the base, the pattern is washed with soap or a solution of "gold dust" washing powder, washed again with clear water (room temperature) and thoroughly dried. Proper proportions of investment and water are placed in a bowl and mechanical spatulation or hand spatulation is applied with the bowl upon a vibrator. This will force the minute air pockets

from the mix before it is applied to the wax pattern. In applying investment to a wax pattern, it is best to push a mass of investment ahead of the brush so that the junction of the investment and the wax can be seen at all times. This will lessen the hazards of trapping air bubbles. If a heavy dense mix is used for the core, it is necessary to vibrate the investment into the core. In producing a core with a thin mix of investment, the amount of expansion obtained is not so great as that with a dense core. A thick dense mix of investment for the core to cover all cavity surfaces, and a less dense mix to cover the remaining surfaces of the pattern, together with wax expansion and thermal expansion of the investment, will give the greatest expanded mold for casting in our present casting procedure.

In the process of eliminating the wax, the time required will depend on the size of the wax pattern and the temperature of the furnace. Occlusal, mesioclusodistal and three-quarter crown types of patterns should be burned out at a temperature of from 600 to 800 F., for twenty minutes. The full crown type is allowed to remain in the heat for twenty-five minutes. More thermal expansion of the investment may be obtained if the mold temperature is carried to 1200 F. The higher temperature is usually necessary in dimensional casting.

It is well to use an investment with a low plaster content, as this will tolerate a high degree of heat, and the high heat gains more expansion of the refractory material. Most low plaster content investments expand gradually in proportion to the degree of heat applied up to the maximum expansion.

The mold should be placed in the casting machine immediately on removal from the furnace and the casting made. If it is allowed to cool before the casting is made, the thermal expansion of the investment is lost. Therefore, castings should be made at the highest temperature obtained in the furnace.

INLAY BRIDGE ATTACHMENTS

The use of inlays as bridge abutments in the posterior part of the mouth, as a standard, is problematic and open to discussion. In mouths of average hygienic condition, the inlay bridge attachment of proper construction has prophylactic advantages over the gold shell crown. In some instances, the inlay attachment may loosen on one end of the bridge, and the patient be unaware of this fact until caries has made considerable progress. It is then necessary to make another abutment and, many times, add another tooth to the bridge. If the best results are to be obtained from bridge abutments, they must be inspected often. I have had the unpleasant, yet educational, experience of having some inlay bridge abutments of the mesioclusodistal type become loosened. The three-quarter crown offers much more success, yet some of these lose anchorage on short teeth. The loose abutments have been replaced with full cast crowns which seem to hold very firmly. My experience with full cast crowns as bridge abutments has been very satisfactory.

When we see crowns that have been giving good service for from twenty to twenty-five years, we sometimes wonder whether the large inlay restoration can give similar service.

In conclusion, the following principles must be incorporated in any inlay procedure for the operator to get consistent results:

1. There must be proper cavity preparation or defeat must be acknowledged in the first step.

2. A well-adapted wax pattern is necessary, with definite margins.

3. A conscientious application of the investment to the wax pattern is required.

4. Elimination and casting must be a systematic procedure.

In a word, possibly the greatest point in any inlay technic is system. Haphazard methods afford little in return. In any line of endeavor, system tends to success and few are successful without it.

608 Equitable Building.

DISCUSSION

H. D. Coy, Hamburg, Iowa: The three requisites for success in the making of a casting are: (1) a well prepared and well finished cavity; (2) a properly fashioned wax pattern which fits the cavity, and (3) a casting which exactly reproduces the wax pattern. Failure to give due consideration to any one of these principles will inevitably result in the failure of the finished restoration. Conservation of tooth structure and the protection of the pulp should be given first consideration in the preparation of any cavity. The careful operator will have little difficulty in preparing cavities of the Black type without endangering the life of the pulp. They are boxlike, with a flat gingival seat and definite angles. If the same painstaking care were required in the making of an inlay restoration as that employed by the gold foil operator in his work, the inlay would more nearly approach the ideal already reached by the foil filling. A wax pattern may be made of a very poorly prepared cavity. Failure in this first requisite dooms many inlay restorations almost before they are begun. With the vast number of scientific facts now available concerning the physical characteristics of the materials used in dental casting, we find it comparatively easy to cast to any desired dimension. There would seem to be little to justify argument in favor of any type of cavity preparation which does not include the principles of a flat seat and a definite angle. Dr. West states that most investments of high silica and low plaster content reach their maximum expansion at about 1200 F. Rather than to carry the mold to a temperature of only 800 F., as recommended, it would seem to be a better procedure to expand it to the maximum, thereby relying less on the expansion of the frail and plastic wax pattern. As regards the use of wax expansion as an aid in overcoming the shrinkage of gold from the molten state to the point of crystallization, it would be assumed from Dr. West's paper that all inlay waxes have the same amount of thermal expansion when subjected to the same changes in temperature. I wish to call your attention to the extensive experiments on these waxes made by the United States Bureau of Standards. The charts shown by them in the January, 1931 issue of THE JOURNAL indicate that almost every inlay wax has a different expansion curve. The Bureau advocates the printing on each package of wax or investment of the characteristics of that certain brand of material. Without definite knowledge of the expansion produced by each degree of temperature, it is difficult to determine how much will be necessary in compensating for the shrinkage of the gold. Standardization of these waxes and investments and the printing of the thermal expansion curve, with the other physical data on each package of material, will do much toward simplifying the casting process. The shrinkage of gold has been proved, by extensive experiments, to be constant at 1.25 per cent by volume of the gold. By expanding the mold or pattern or both to compensate for this shrinkage, we are able to cast to dimension. This will not be difficult to accomplish if the dentist is able to secure his favorite brand of wax and investment with the thermal expansion curve accurately determined and printed on the package by the manufacturer.

J. J. Travis, Ann Arbor, Mich.: If more men were able to make perfect wax patterns in the mouth, a more excellent service to our patients would result, but like many other operative procedures, this one has its limitations. The remote portion of the mouth, the interference of the restless tongue, thick cheeks and ever-present saliva, the difficult access and poor light render direct pattern making next to impossible. Deep cervical margins will extend below any point that can be reached with strips, and finishing these margins with instruments by the sense of touch alone in a highly sensitive area where hemorrhage is sure to result leaves too much to the imagination. A good amalgam model, in the hands, correctly articulated, with good light and none of the sources of interference present, gives the operator great advantages. I therefore beg to amend what Dr. West has said concerning inlay cavity preparation by suggesting a modification of the accepted cavity form to facilitate the withdrawal of a modeling compound impression without distortion. This modifica-

tion in cavity form would consist merely in taking a slice from the mesial and distal convexity around which the impression material wraps itself and, when chilled, cannot be withdrawn without distortion or fracture. To be sure that I am not misunderstood, allow me to state clearly that this modification applies only when the individual operator feels that he can render a better service by employing the indirect method of operating. Dr. West has described an almost universally approved cavity form with flaring buccal and lingual walls which lends itself perfectly to the direct method of operating and offers compensation for the shrinkage of the cast. Where the direct method of operating can be employed advantageously, this cavity form cannot be improved on from the standpoint of esthetics or strength, but it is not adapted to indirect work. As dentists, let us always remember that we are rendering primarily a health service; and while the perfect sealing of a cavity is very important, the most essential factor in these operations lies in giving the best possible protection to the vital pulp. Thousands of pages of literature in our dental magazines and hundreds of hours of discussion on the floors of our dental meetings have been devoted to the question of the pulpless tooth. Negligence on the part of the laity and operative mistakes on the part of the operative dentist are in the main responsible for the condition of these dead, dying or degenerating pulps. We cannot be held accountable for the negligence of the laity, for most intelligent people are learning something of the dire results of foci of infection in the mouth. Neither can we evade the responsibility for operative mistakes that lead eventually to the death of the pulp. It therefore seems to me that any consideration of cavity preparation for the gold inlay is not complete without some reference to the protection of the pulp. If a fraction of the time that has been devoted to the study of the pulpless tooth problem and the treatment and filling of some of these root canals had been spent in earlier operations on these teeth, in conscientious cavity preparation, disinfection, the sealing of open tubules in freshly cut dentinal surfaces and the placing of nonconductors to protect the pulp from oft-repeated thermal shock, the number of dying and degenerating pulps would be reduced tremendously. When the generally accepted principles given to us by Dr. Black were worked out, they took into consideration the materials with which the restorations were to be made. That is axiomatic. Those materials were gold foil and amalgam. Since then, the casting technic has been evolved and greatly improved, so that materials many times stronger are now in common use; which renders deeply cut cavities, for retention only, no longer necessary or defendable. During those days when gold foil and amalgam were used to fill teeth, brick and mortar were used to construct buildings that rarely were higher than five or six stories. Now, there seems to be no limit to the height of buildings. The fundamental principles of architecture have not changed, but the form and details have been modified to conform with the materials in use. The fundamental principles of cavity preparation need not be changed in order that we may take advantage of the greater strength of filling materials by using thinner walls in our inlays and thus protecting the pulp from thermal shock. It is not necessary that we eleminate a definite cervical floor, but it should be narrower mesiodistally and be cut with greater precision. The resistance form on the occlusal surface can even be widened if it seems necessary, but let us be careful about encroaching too closely on the horns of the pulps or the recessional lines because of their peculiar histologic structure. Nothing has has been said about investments, their physical properties, manipulation or behavior under heat. Nothing has been said about alloys, their adaptability or behavior in the mouth or heat treatment. Nothing has been said about waxes, their physical properties or limits in expansion. In fact, nothing has been said about dimensional casting, although my interest in these topics has been greatly stimulated by my work with the Bureau of Standards Research Committee during the past year. I appeal to you for more conservative cutting in our cavity preparation, finer details in line angles and point angles, elimination of frictional heat, proper sealing of dentinal tubules, conscientious removal of decay, disinfection of cavity walls and the employment of cement as a nonconductor in thermal change in all deep cavities.

ANATOMY OF THE TEMPOROMANDIBULAR ARTICULATION AND ADJACENT STRUCTURES*

By HAROLD LYTTON HARRIS, D.D.S., St. Paul, Minn.

FROM the point of view of prosthetics, as has been previously said,[1] the anatomy of the mouth is readily divided into three parts: the anatomy of (1) the seating and peripheral areas; (2) the temporomandibular articulation, and the muscles of mastication, or that part which has more to do with function, and (3) that part which is concerned more with the esthetics, or the muscles of expression. In this paper the anatomy of the second of this group will be taken up, i. e., of the temporomandibular articulation, and the muscles of mastication.

OSTEOLOGY

The osteology of the joint involves the squamous portion of the temporal bone and the condyle. The temporal bone is composed of three portions, squamous, petrous and mastoid. The squamous portion consists of two parts, the first being somewhat translucent because of its thinness, flat, scalelike in shape and extending vertically to form part of the brain case. The second is much broader, extending horizontally, the outer surface forming the roof of the auditory meatus and the glenoid fossa, while the inner surface helps to form part of the brain case. From the lower border of the squamous portion, the zygomatic process arises from a broad base, passes laterally and forward, thinning out as it articulates with the malar bone to form the zygomatic arch. This process presents four surfaces, a thin upper surface, giving rise to the temporal fascia, a medial surface giving origin to the masseter muscle, a broad lower concave border, also giving origin to fibers of the masseter, and a lateral surface, which is subcutaneous. At its base, the zygomatic process presents three roots. The anterior root, short, broad and convex, passes medially to terminate as the articular tubercle, which is covered with cartilage for articulation with the condyle. This root forms the anterior part of the glenoid fossa. The second or middle root, usually rather prominent, forms the postglenoid process and is situated immediately in front of the petrotympanic or glasserian fissure, separating the articular portion of the glenoid fossa from the external auditory meatus. The third or posterior root, which is prominently marked, extending backward as a ridge above the external auditory meatus, is called the temporal ridge or the supramastoid crest, marking the border between the squamous and petrous portion of the temporal bone.

The mandibular or glenoid fossa, which lies between the anterior and posterior roots, is a large hollow covered with cartilage. It is bounded anteriorly by the articular tubercle and posteriorly by the tympanic plate, which separates it

*Read before the Section on Full Denture Prosthesis at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

1. Harris, H. L.: A Consideration of Anatomy of Mouth, and Its Relation to Upper and Lower Full Denture Construction, J. A. D. A., 18:1220 (July) 1931.

from the external auditory meatus. The glenoid fossa is divided into two parts by the petrotympanic or glaserian fissure, through which passes the anterior tympanic branch of the internal maxillary artery. The first part is covered with cartilage for articulation with the head of the condyle; the second part, or nonarticular, is formed by the tympanic plate. Later, the changes that take place in this area when the condyle is forced backward into the nonarticular portion under closed-bite conditions, as first described by George S. Monson,[2] of St. Paul, will be discussed.

The condylar process of the mandible presents the condyle and its supporting structure, the neck, which is greatly narrowed. The condyle is oval, with its long axis transverse to the upper border of the ramus, but oblique in relation to the median axis of the skull. Thus, the lateral extremity, on which is the condylar tubercle for the temporomandibular ligament, is slightly farther forward than the medial extremity. The articulating surface is convex, covered with cartilage. The anterior border of the condyle and the concave anterior surface of the neck are roughened for the insertion of the major part of the external pterygoid muscle.

CLASSIFICATION OF JOINTS

The various joints or articulations of the body are grouped under three main classifications. 1. Synarthroses are characteristic of the bones which are united by fibrous tissue, including both movable (syndesmosis) and nonmovable (suture) types. The articulation of a large number of the bones of the skull come under the nonmovable or suture type. Also included in this type of articulation, under the heading "gomphosis," which is described as a "peglike process lodged in a corresponding socket," are the roots of the teeth. The second great classification is the synchondrosis group, in which a small amount of movement is allowable, such as intervertebral joints. The uniting substance in synchondrosis joints is cartilage. Lastly, the third great classification is diarthrosis, the constituents of which are (1) two or more bones each covered by a hyaline cartilage, (2) a fibrous capsule uniting the bone and (3) a synovial membrane which lines the fibrous capsule and covers any part of the bone enclosed in the capsule, not covered with articular cartilage. An interarticular plate of cartilage may or may not be present in this type of joint. The articulation of the condyles of the mandible with the skull is correctly described as: classification, diarthrosis; subclassification, heteromorphous; division, condylarthrosis; heteromorphous indicating unequal and dissimilar surfaces in contact; condylarthrosis indicating a convex surface which is ellipsoidal, fitting into a corresponding concavity. The wrist and metacarpophalangeal joints come under the same group. Terry says, "Such a classification is purely academic. No classification, however perfect, must be taken as final, and each joint should be studied as a separate thing altogether apart from any systematic arrangement."

THE LIGAMENTS

The ligaments involved in the temporomandibular articulation are as follows: (1) the articular capsule, (2) the sphenomandibular, (3) the stylomandibular and (4) the articular disk. These ligaments serve to limit the movement of

2. Monson, G. S.: Case Histories, J.A.D.A., 11:55 (Jan.) 1924; Impaired Function as Result of Closed Bite, J.N.D.A., 9:833 (Oct.) 1921; Architectural Bone Changes of Face and Cranium, Tr. Seventh Internat. Dent. Cong., Vol. 1.

the joint and are composed of fibrous tissue. The articular capsule is described as consisting of four portions, (*a*) the anterior portion, which consists only of a few fibers passing from the articular tubercle above to the anterior surface of the condyle below, and at its middle connecting with the articular disk, or meniscus; (*b*) the medial portion, sometimes called the short internal lateral ligament, a broad band of fibers attached above to the lateral side of the spine of the sphenoid and medial edge of the glenoid fossa, and below to the medial side of the neck of the condyle; (*c*) the posterior portion, which is attached above just anterior to the glaserian fissure in the glenoid fossa, and below to the posterior surface of the condyle, and, lastly (*d*), the lateral, or more commonly called temporomandibular, ligament, which is the strongest part of the articular capsule. It can be demonstrated as composed of two groups of fibers arising from a part of the articular tubercle, and also from the lower edge of the zygoma. The fibers from the tubercle are short and vertical, while those coming from the zygoma are longer and incline downward and backward. Both groups are inserted on the lateral surface of the condyle.

The second, or sphenomandibular, ligament, otherwise known as the long internal ligament, is a thin band of fibers situated medially from the joint. Anatomists believe it is a fibrous remnant of the mandibular bar of Meckel's cartilage. It is attached above to the spine of the sphenoid medial to the attachment of the medial portion of the capsular ligament and passes downward and forward to be inserted on the lingula of the mandible. Many structures of interest pass between the ligament and the ramus, such as the inferior alveolar nerve, the internal maxillary artery and vein, a portion of the external pterygoid muscle, the auriculotemporal nerve and the middle meningeal artery.

The third, or stylomandibular, ligament, also known as the stylomaxillary, is more correctly described as a thickened portion of the deep cervical fascia, attached above to a joint near the tip of the styloid process, and is inserted on the posterior border of the mandible at the angle of the jaw between the masseter and internal pterygoid muscles.

The fourth ligament is more familiarly known as the articular disk, or meniscus. It is an oval plate of fibrocartilage placed between the articulating surfaces. Its surfaces conform in shape to the form of the articulating surfaces, that is, its inferior surface is concave and fits on the articulating surface of the condyle, and its superior surface is concavoconvex, to fit against the concavity of the articulating surface of the temporal bone posteriorly. The meniscus is thicker at its periphery than at its center, and frequently the center is found perforated. As the disk separates the joint into two synovial cavities, the perforation at the center allows the passage of the fluid of one cavity to the other. A small number of fibers from each portion of the capsular ligament are attached to its periphery, and on its anterior border some fibers of the external pterygoid muscle are inserted, to which has been given the name the sphenomeniscus muscle.

BLOOD AND NERVE SUPPLY

The blood and nerve supply to the temporomandibular joint is derived from the temporal, middle meningeal and ascending pharyngeal arteries; the nerve supply being derived from the masseteric and auriculotemporal nerves.

THE MUSCLES OF MASTICATION

The muscles of mastication, or cranio-

mandibular muscles, all have their origin on the base of the skull and their insertion on the mandible. In the lower vertebrates, or selachians, they are formed in a single muscle mass, the adductor mandibulae. In the higher vertebrates and man, they become differentiated in embryonic development into separate, distinct bands of muscle, and, in man, the four muscles recognized as the muscles of mastication are: (1) the temporal, (2) the masseter, (3) the internal pterygoid and (4) the external pterygoid. The temporal originates from both the whole of the temporal fossa and the fascia covering the fossa. The muscle at its origin is thin and fan-shaped, the fibers quickly converging into a tendinous band of muscle fibers passing downward to be inserted on the coronoid process, with many tendinous fibers continuing on down the anterior border of the ramus to be inserted partly in the retromolar triangle, and, in many of my dissections, some fibers have continued on down to be inserted on the body of the mandible just distally to the posterior border of the mylohyoid muscle. Its nerve supply is from three small branches of the masticator, or motor, root of the mandibular division of the trigeminal nerve.

The masseter muscle is divided into two distinct groups of fibers. The superficial layer arises from the anterior two thirds of the lower border of the malar, or zygomatic, bone, the fibers passing obliquely downward and backward to find a tendinous insertion in the lower half of the external surface of the ramus down to the angle, with some fibers finding insertion in the adjacent body of the mandible. The deeper layer originates from the lower border and medial surface of the zygomatic arch, the fibers passing almost directly downward to be inserted in the upper half of the external surface of the ramus. The nerve supply is from a branch of the masticator nerve.

The internal pterygoid arises mainly from the pterygoid fossa and partly from the tuberosity of the maxilla, the fibers from both origins passing downward, backward and outward, from a lateral view, apparently paralleling the fibers of the masseter, though the two muscles converge to be inserted in the lower half of the medial surface of the ramus down to the angle and extending to the mylohyoid ridge. This muscle is supplied by the internal pterygoid nerve, which branches off the mandibular nerve near the foramen ovale, passes through the otic ganglion, then into the body of the muscle. Frequently, tiny branches of the lingual nerve pass into the muscle.

The external pterygoid is likewise formed by two groups of fibers, the superior portion arising from the infratemporal or pterygoid crest, also the adjacent portion of the under surface of the great wing of the sphenoid, the fibers converging horizontally backward to be inserted into the upper portion of the condyle, with a small band of fibers being inserted into the meniscus, described by the late Dr. Prentiss, of Iowa, as the sphenomeniscus muscle, though the fibers are difficult to differentiate from the rest of the muscle fibers except at the point of insertion. The inferior portion, which is the larger, arises from the lateral surface of the lateral lamina of the pterygoid process, and from the pyramidal process of the palatine bone, and a small number of fibers from the tuberosity of the maxilla, the fibers converging horizontally backward to be inserted in the anterior surface of the neck of the condyle. A branch of the masticator or motor root of the trigeminus serves both portions.

The muscles of mastication act on the joint as follows: to elevate the mandible, the temporal, masseter and internal pterygoid muscles; to depress the jaw, the external pterygoid in harmony with the mylohyoid, digastric, geniohyoglossus and muscles attached to lower surface of the hyoid bone; to protract or protrude, the external pterygoid muscles, superficial fibers of the masseter and anterior fibers of the temporal muscles; and to retract, the posterior fibers of the temporal muscles, slightly by the internal pterygoid and deep layer of the masseter muscles.

VARIATIONS IN JOINT

Variations from the normal relationship of the condyle to the glenoid fossa occur when there is a deviation from the normal in the occlusion of the teeth. Malocclusion caused by loss of teeth, abrasion of teeth, faulty partial and full restorations or abnormal influences at the time of osseous development of the parts results in some changes in the joint to compensate which, if allowed to continue, will cause serious impairment of such physiologic functions as hearing, respiration and deglutition. The profession is indebted to George S. Monson for his research along these lines, which led to his deduction that the loss of facial dimension, or closure of the bite, results in impaired function and inharmonious relation of the parts involved. In 1921, Dr. Monson[2] pointed out:

> Clinically we find patients with loss of facial dimension because the mandible is too close to the maxilla, due to improperly constructed dentures, wear on natural teeth, or any other reason. The shortening of this osseous framework, as just stated, naturally shortens the distance between the origins and insertions of the masticating muscles, causing a decrease in muscle pull and consequently throwing out of balanced muscle activity. The loss of balance in muscle activity and closing of the bite is the prime factor in producing the backward movement of the condyle, which then encroaches upon the external auditory meatus, and often causes a resultant defect in hearing in a degree proportionate to the amount of encroachment.

The wisdom of this principle has been verified by a host of followers: Wright,[3] of Pittsburgh, who coined the term "traumatic deafness," Bird, Cruttenden and Washburn, of St. Paul, McGrane,[4] of Sioux City, and many others. An intimate knowledge of the anatomy of the joint will enable anyone to see the correctness of Dr. Monson's theory. Any condition which will allow the patient to close the mandible beyond the point of greatest efficiency which he developed with the natural teeth allows the strong temporal, masseter and internal pterygoid muscles to thrust the condyles back into the nonarticulating portion of the glenoid fossa. As described previously in this paper, the nonarticulating portion of the glenoid fossa is formed by the tympanic plate, a thin plate of bone separating the glenoid fossa from the external auditory canal. The tympanic plate, as well as a portion of the meniscus, undergoes a gradual absorption, as will any bone or tissue exposed to a sustained pressure. This change is described in pathology as "pressure atrophy," and recults in the condyle causing a condition anywhere from a slight intrusion to a complete closure of the external auditory canal.

Another structure not infrequently affected by the backward thrust of the mandible is the auriculotemporal nerve. The nerve usually branches off the mandibular portion of the trigeminus by two

3. Wright, W. H.: Deafness Influenced by Malposition of Jaws, J.N.D.A., 8:979 (Dec.) 1920.

4. McGrane, H. F.: Traumatic Deafness Caused by Retrusion of Condyles of Mandible on External Auditory Canal, J.A.D.A., 12: 1231 (Oct.) 1925.

roots, which immediately embrace the middle meningeal artery, then unite to form one nerve trunk. It then passes backward along the medial surface of the external pterygoid, between the sphenomandibular ligament and the joint, lying posteriorly in close relation to the meniscus. Any condition which allows the condyle to be forced posteriorly in the glenoid fossa may press the auriculotemporal nerve against the tympanic plate, it becoming easily discernible by digital examination of the external auditory meatus. Pressure on this nerve in reported cases usually results in severe reflex pain, which is immediately relieved by advancing the mandible and restoring the lost facial dimension.

Likewise, the act of deglutition is seriously impaired by the loss of facial dimension or closure of the bite. Quoting further from Dr. Monson:

> Much of the functional activities of the structures of the neck depend upon their being suspended in nearly the normal position, as nature planned. The tongue with its great function of swallowing must have an area to work in as well as proper relationship to adjacent tissues and parts, which depend for health upon drainage resulting from the act of swallowing. This is particularly noticeable in the mucous membranes about the teeth and the drainage of the eustachian tubes . . . further, a closure from the normal of one-half inch reduces the oral cavity area two cubic inches; a closure of one inch reduces the oral area four cubic inches.

The encroachment of the condyle on the external auditory meatus is again a means of diagnosing this condition. Chronically inflamed tonsils, catarrhal conditions and pyorrhea, many times due to closure of the bite, have been corrected by a restoration of facial dimension and harmonious relationship of the structure involved.

The importance of a thorough knowledge of the temporomandibular articulation and adjacent structures, while it should not need emphasis at this time, is not fully understood by a great many in our profession. The significance of the correct position of the mandible in relation to the maxilla is overlooked in a great number of cases, whether the natural teeth are present, or the case edentulous. In periodontia, orthodontia and the various branches of prosthodontia, a mandibular balance or equilibrium should be the watchword; and back of the whole picture must be a clear visualization and complete understanding of a normal relationship of the mandible to the maxilla, and their associated structures, the muscles of mastication, and the muscles and structures of the face and neck. The profession will always be indebted to Dr. Monson for the work he has done, for the principles he has founded and for the inspiration he has given others to carry along the research, in order that the future ages may find out the right, and the patients whom we serve, because of our resulting increased interest in physiologic function as well as mechanical performance, may receive greater benefits.

DISCUSSION

Chastain G. Porter, Kansas City, Mo.: This paper is a clear concise description of the anatomic structures associated with the temporomandibular articulation. It emphasizes the points of greatest importance and should be an incentive for increasing anatomic knowledge, so necessary to denture construction of the highest type. The dental mechanism may be likened to a machine for grinding and crushing food. The motive force is, of course, supplied by the muscles of mastication. The ligaments limit the range of movement. The shape and contour of the osseous structures act as a guide to the direction of movement of the mandible and, in great measure, determine the movement of the working points, the teeth. The cutting or working points and their supporting structures are the only part of the machine which

is subject to loss or mutilation and which must be restored to function. A thorough knowledge of the whole mechanism is necessary in order to replace the lost parts so that they will function in harmony with the remaining, constant structures. Much labor and thought has been expended in the past in an effort to design an instrument to reproduce individual mandibular movement. It may never be possible to do so exactly with a metallic mechanical device, as it can never reproduce tissue resiliency both in the joint and under the denture base. It is necessary closely to approximate individual mandibular movement with an articulator when using cusp, or so-called anatomic, teeth. Even in the use of the newer mechanical types of posterior teeth, a thorough understanding of mandibular movement is essential to a satisfactory correlation of tooth alinement and anatomic form and function. It is interesting to note that mandibular movement will harmonize with a properly oriented average curve, based on the Monson 8-inch sphere, in a great majority of cases. This may be due partly to the elasticity and resiliency of the structures around the joint. An understanding of the anatomy is necessary to recognize such harmony of movement and to establish it, if absent. Dr. Harris' remarks regarding the proper number of openings are good. His quotations from Monson are as true today as when written ten years ago. The ideal vertical relationship of the mandible to the maxilla is such as to avoid an intrusion or to prevent the condyles from encroaching against the posterior boundary of the glenoid fossae. If maintained in this position, the mandible functions as a lever of the second class, the bolus of food acting during mastication as the fulcrum on the posterior teeth. Overclosure changes the mandible into a lever of the third class and places the fulcrum at a point in the posterior boundary of the fossa, resulting in trauma. Any condition conducive to prolonged mastication on the anterior teeth will produce a similar trauma. The ideal amount of opening should be striven for in most cases and patients should be educated to appreciate it. In many cases, it is unwise to attempt this ideal amount of opening. In youth or middle age, the muscles and other structures have been developed to function in the ideal position. In extremely old patients or others in which a marked deformity has existed for a long time, these structures, as well as the suprahyoid structures, have assumed a new position. In such instances, the prosthetist must subjugate his desire to attain the ideal and must be satisfied with a shortened intermaxillary interval. Any change must be brought about gradually by construction of a series of dentures. If too abrupt a change is made, the patients will not wear the dentures. This is especially true of those patients who lack perseverance or who are in declining health, for to them comfort is of paramount importance. If this discussion strays from the text of the paper at times, it is merely because the principal part of the paper on anatomy is of such a nature as to need no discussion. It should be accepted as a complete résumé of the anatomy of the region and calls for no further comment.

Dr. Harris: The purpose of this paper was to review the anatomy, just as my paper of last year[1] reviewed the anatomy of the seating areas of dentures. A review of the literature shows us that we have paid less attention to the physiology and the anatomy of the temporomandibular articulation than we have to the mechanics involved. As Dr. Porter has stated, care must be exercised when the bite is opened. Fortified with a knowledge of anatomy and physiology of the parts involved, and with an instrument that is capable of reproducing the movements of the mandible, the prosthetist is justified in this procedure and it becomes a proper treatment for the betterment of the patient's health and happiness. The results obtained in hundreds of cases by various members of the Monson group justify this study of anatomy and physiology.

RESPONSIBILITY OF THE DENTAL PROFESSION CONCERNING HEALTH*

By BOYD S. GARDNER, D.D.S., Rochester, Minn.

IN order that the dental profession shall shoulder its responsibilities in the great problem of health, it is necessary to emphasize the importance of having more knowledge of systemic conditions of patients who seek dental advice and service, and more knowledge of the cause and effect of the two diseases that attack the human race more than any others; namely, dental caries and periodontoclasia. Perhaps some way will be worked out by those who are interested in dental education to ensure that the dentist of the future shall have the necessary knowledge without constantly having to seek the aid of a competent physician, but it is the dentist practicing dentistry today who needs help in meeting his responsibility concerning health. In the United States, about 58,000 dentists are in practice today, and they will maintain their positions for many, many years before the dentists of the future can take over their work.

The dental profession has an added responsibility with the ever increasing knowledge that is going directly to the public regarding dentistry, and it behooves dentists to keep pace with this advancement. They cannot afford to fail to fulfil the demands of a well-educated public.

It is the information presented by physicians and dentists, in articles published in the daily newspapers and magazines and the press in general, that is particularly noticed by the public. The great amount of publicity work that is being carried on under the auspices of dental societies, as well as the far-reaching effects of the school clinics, must not be overlooked.

There is very little, if any, criticism, of this type of publicity, but information that comes from manufacturers of toothbrushes, dentifrices and mouth washes, through the public press and the radio, is often severely, and in some instances justly, criticized. We should appreciate that these manufacturers will prosper regardless of our criticism, and at least some of them plan educational programs which will offer keen competition to the work done by our educational institutions.

Some dentists may not realize the far-reaching effects of a one minute radio talk. To illustrate: Recently, a short radio talk was given regarding the "six-year" molar, and as a result of the manufacturer's effort to draw attention to his product, several thousand letters were received, some in thanks for the information and others seeking more information about this particular tooth. This emphasizes how keenly the public is inter-

*From the Section on Dental Surgery, the Mayo Clinic.

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

ested in dental matters, and how eager it is for knowledge. Many people who do not read listen to the radio.

Progressive dentists have little to fear from public sentiment, but the progressive dentist has a responsibility to make all dentists better dentists. The level of dentistry in a community is a dental responsibility.

Many dental colleges are a part of state universities, which are kept up by general taxation. Such institutions, particularly, should make special efforts to encourage instruction for graduates, and should let the public know, in such states, that their money is not spent only for the teaching of undergraduate students. These dental colleges should be open all year, and all the encouragement possible should be given to the development of instruction of graduates. In the states where there are no dental colleges, the dental societies must necessarily take over all problems of graduate instruction, but the main thing is to let the public know that such an effort is being put forth, and that from the standpoint of opportunity to learn and to keep up with progress, there is no excuse for any dentist to be remiss.

Public sentiment is an all-powerful weapon, and it seems reasonable that the dental profession should so conduct itself that the public will not have to interfere. If we have panel dentistry, it will come because of the attitude of the public toward us. Dental societies can be likened to churches in that their object is to do good. A sign on a church "For members only" would receive severe criticism.

It is rather humiliating for the dental profession to have to admit that before it can earn money enough to live as a profession, a dental condition must be allowed to progress so far that the tooth will have to be extracted, or at least become so decayed that it will have to be filled. It is even difficult for some members of our own society to appreciate that not 1 per cent of dental incomes comes from practicing preventive dentistry, and that about 80 per cent of income is from the replacement of lost teeth. It is dentures, bridges, etc., that are the real "bread and butter" for the dentist.

The intelligent public is becoming more interested in the preventive phase of medicine, and it soon will learn that dental decay is a symptom of something going wrong elsewhere in the body. Such members of the public are also going to expect more than a mechanical attempt on the part of the dentist to arrest decay. In many cases such work is a failure, since the cause of the condition of the tooth is not corrected.

As soon as the word "prevention" is mentioned in regard to dental caries, attention is at once directed to nutrition, for it seems that patients suffering from defective teeth because of deficient heredity are few in number.

In a review of the literature, it is found that, from the beginning of medicine to the present time, interest in diet has gone more or less in waves. At present, we are on the crest of one of these waves, and much more knowledge than ever before is available on the subject.

I agree with Davis[1]:

> Never before has hope for the discovery of the cause and control of dental caries been more bright than at the present time. The last word has yet to be spoken. Much additional research is still necessary to establish all the essential elements, but enough has been established to point unmistakably to the importance of proper nutrition. It is interesting to know that such workers as Bunting, Mellanby, McCollum, Drain, Howe and

1. Davis, W. R.: Editorial, Michigan Dent. Soc. Bull., 43:13 (March) 1931.

others, pursuing their own separate investigations, are coming to many similar conclusions.

The dental profession has shown its interest by contributing heavily to the literature on nutrition. In fact, it is admitted by those in a position to know that dentists have written more articles than have physicians. This is no doubt due to the fact that diet has a direct bearing on cases coming to the dentist; whereas, physicians deal with many cases in which diet has no direct bearing. There is a growing interest in nutrition on the part of the medical profession as is shown by the attention given problems of diet at the meeting of the American Medical Association in June. The Section on Pharmacology and Therapeutics, headed by Wilder,[2] devoted one session to a symposium on diet and nutrition, and a number of papers were presented in other sections. Wilder pointed out that there has been general neglect of sound dietary treatment by practicing physicians, owing largely to deficiency of education in this regard.

He writes:

> I shudder to recall the dietary crimes that were committed a decade ago by those of us who were treating diabetes with the starvation methods then prevalent. Green vegetables were thrice cooked and so were deprived of their vitamin and mineral content, and the terrific deprivation of calories, together with a low intake of protein, meant constant wastage of nitrogen. The occurrence of nutritional edema was actually considered a beneficent complication, since it often masked the loss of body weight. . . . The discovery of insulin has fortunately obliterated that awful picture. Children with diabetes since the introduction of insulin have compared advantageously with those who do not have diabetes. Their teeth are practically free from caries; their bodies strong and their minds alert. It is not unlikely that the detailed attention given to their diets is in part responsible. Boyd and his associates commented on the absence of dental caries in the diabetic children of their clinic and were led by this observation to try diets similarly planned for normal children. The calories for the group with diabetes were supplied largely by fat and for the normal group by carbohydrates, but the essential constituents were the same, fruit, milk and so forth, and the results were the same—dental caries was arrested in all cases.

Many dentists have been stimulated by such encouragement to outline special diets, particularly for those patients who have active caries, and there is no doubt that satisfactory results have been obtained in many cases; yet it is difficult to overcome dietary habits. For generations, we have been more or less the victims of new ideas concerning food and combinations of foods, without respect to the part that they play in health. Many foods were prepared to be pleasing to the eye, rather than to the stomach. Sugar had to be refined, and white flour made whiter by bleaching. Moreover, our food in general is so prepared as to give little exercise to the teeth. Persons have formed gastronomic likes and dislikes, and it seems that if there is a great deal to be accomplished, it will be done through a diet of reenforcement rather than through a radical change in the usual diet.

In our school clinics, we can point out foods that will make for sound teeth, but the child returns home and is defeated in his efforts to help himself by his parents, whose habits are not easily changed. As a result of the research on the relation of dental caries to diet, there is certain to be some product developed that ultimately will meet the approval of both the medical and the dental profession. It will be prescribed perhaps as a concentrated food to reenforce the usual meal,

2. Wilder, R. M.: Significance of Diet in Treatment, J. A. M. A., 97:435 (Aug. 15) 1931.

which generally is inadequate, by addition of the necessary minerals and vitamins. Moreover, it has been found that the child with active caries, even if he changes to the best diet possible, needs some help until the corrected diet will suffice.

In the selection of dental students,[3] the dental profession, represented by the faculty of the dental colleges, has another responsibility, for dental students should possess some inherent traits: the personality and ability to look and act the part of a dentist, besides intellectual capacity, craftsmanship and mechanical ability. Only the best environment and teaching tend to furnish the necessary qualifications for the successful practice of dentistry. It would be fairer to all dental applicants if they were more carefully chosen and not admitted merely because they have the scholastic requirements and the money to pay the tuition.

Another responsibility of education is a thorough medical examination for each student, with particular attention to the eyes. It is unfair to allow a student to matriculate in and continue through any dental college, and perhaps in his senior year or soon after graduation find that his sight is so impaired that he cannot become a successful dentist, or that he has some other physical defect that likewise may handicap him. These medical examinations should be repeated every year, and if the members of the faculty would also have annual medical examinations, they would set the student body a good example. The knowledge gained would add to the medical background of dental education. The young dentist would also appreciate the advantage that he would have if he knew the systemic condition of the patient for whom he is to give dental advice and treatment; and it seems that there could be more cooperation between medical and dental colleges. The senior medical student could conduct the medical examination for the senior dental student, and the senior dental student could inform the medical student as to the dental needs, with mutual profit.

In the treatment of pulpless teeth, the dental profession as a whole has a great responsibility, but those dentists who pay particular attention to treatment of root canals, who give clinics and who write papers on this subject have a greater responsibility.

In their educational work, the dental profession stresses the necessity of using the roentgen rays, but the fact is not emphasized that only half of the dentists in the United States have x-ray machines, many of which are seldom, if ever, used. I may say that some are for show only. It is therefore apparent that only a very small percentage of dentists make adequate use of roentgen rays, either by using their own apparatus, or by referring patients for examination. It seems, therefore, that only this small percentage of dentists should be encouraged to do root canal work. Encouragement is often given to a group who are absolutely unprepared for this type of work. It seems that the leaders among those who treat root canals should emphasize the dangers of the work, and state more bluntly that it should not be undertaken unless the dentist is well equipped from a roentgen-ray standpoint and is otherwise capable of assuming responsibility for this dangerous group of teeth.

Many dentists deceive themselves into believing they have obtained satisfactory results when the roentgenogram demonstrates a favorable change at the root

3. Gardner, B. S.: Plea for Careful Selection of Dental Students, Dent. Survey, 7:35-36 (April) 1931.

ends of teeth that are being treated. Many times, the so-called favorable change will result from merely relieving the pressure at the root end, and without medication. The fact that the amount of infection about root ends of teeth cannot be determined by the extent of tissue change at the apices is overlooked. The roentgen rays do not reveal infection, only the result of infection. At times, it is destruction only and again it is the laying down of new tissue, this depending largely on the resistance of the patient. Moreover, knowledge of the systemic condition of the patient should be the guide in retention of pulpless teeth. There is no question that the systemic condition of a large percentage of persons does not warant retention of any pulpless teeth; for any pulpless tooth, regardless of roentgenologic evidence, can act, sooner or later, as a focus of infection.

Pulpless teeth are not the only dangerous teeth. With present knowledge, teeth affected by periodontoclasia must likewise be regarded as dangerous. This is also true of residual regions of infection, developmental defects, impacted, unerupted and supernumerary teeth, etc.

Even though only about half of the dentists in the United States own x-ray machines, sales are on the increase, and it is apparent that this is an opportune time to call attention to the possibility of infecting one patient from another in the process of exposing dental films. This is another health responsibility. Not uncommonly, there are secondary, and occasionally primary, syphilitic lesions in the mouth, or on the lip, which are not always recognized by either the physician or the dentist, not to mention nonprofessional persons who are employed at times to make exposures of such films. It has been the practice[4] in the Mayo Clinic for the last twelve years to follow a definite procedure in order to eliminate the possibility not only of infecting the patient, but also of infecting the operator. It is assumed that the films come from the manufacturer fairly clean, or it would be necessary to sterilize them as the boxes are opened. The technician uses rubber gloves and does not change for each patient unless the condition of the mouth is questionable. The gloved hands are washed with a liberal amount of soap and water, followed by alcohol after each case. After the films have been exposed, they are laid on a sterile towel, and after exposures for the entire mouth have been made, the films are delivered to the dark room. The dark-room operator also takes precautions to safeguard himself. Between cases, everything that is touched by the technician's hands is wiped off with a 50 per cent solution of alcohol and is allowed to dry. Since this procedure has been instituted, there has not been even a suggestion of any kind of infection which could have been traced to roentgenologic technic. The foregoing precautions are more important when films are placed in the mouth soon after operation, since the opportunity for infection is naturally greater then.

In referring to the responsibility of the dental profession[5] regarding health, attention has been directed to the dangers of pulpless teeth more than to gingival infection, and as more knowledge of the bacteriologic aspect of periodontoclasia is gained, it is found that it plays the same part in focal infection as does infection at the apices of teeth. Many patients have

4. Gardner, B. S.: Safeguarding Patient and X-Ray Technician from Infection in Radiodontia, Radiology, 5:169 (Aug.) 1925.

5. Gardner, B. S.: Management of Infected Teeth in Practice of Group Medicine, J. A. D. A., 16:1013-1017 (June) 1929.

a periodontoclasia which apparently is not sufficiently severe to warrant extraction of all teeth; yet there is little, if any, hope of successful treatment. Many dentists deal with this condition just as they do with the case of a mouth full of decayed deciduous teeth. They argue that although the deciduous teeth are decayed, it will not be long until the permanent set will erupt, and that patients with periodontoclasia can endure the condition until they make their own decision regarding dentures. Two very important health responsibilities are thus neglected. More and more, the need of early extraction becomes apparent in such conditions as pyorrhea, since the longer extraction is delayed, the less adequate will be the foundation for dentures. Moreover, the patients are subjected to infection which might be termed a load for them to carry even if a systemic condition traceable to a focus is absent. The same is true of patients who have a large amount of infection at root ends without dental pain or discomfort elsewhere in the body.

Perhaps in the treatment of patients with periodontoclasia, the word "arrest" rather than "cure" should be used. At the onset of this disease, the term "cure" might be used correctly. Only by cooperation of patient and dentist, by carrying out instructions and especially by returning to the dental office at regular intervals is this disease treated with success. Just as the rash of scarlet fever is indicative of the type of illness from which a child is suffering, so periodontoclasia must be considered as an index of what is going on within the body.

Local conditions, such as traumatic occlusion, lack of oral hygiene and faulty dentistry, no doubt aggravate and tend to make the condition chronic, but there is always a certain background if patients are prone to this disease.

For many generations, physicians have passed to dentists the responsibility in cases of dental caries and periodontoclasia; which no doubt accounts for the lack of interest that physicians have in dental caries and periodontoclasia as indexes. If some other organ of the body should undergo a change such as a tooth undergoes in decay or periodontoclasia, they would be very much interested. Fortunately for the patients, both physicians and dentists are becoming more mindful of nutrition, and by the cooperation of the two professions, dental caries and periodontoclasia will come to be recognized as preventable diseases. In addition, the importance of eliminating dental infection that can act as a cause of so many diseases should always be stressed. Moreover, it should be appreciated that the easiest way to treat focal infection is to prevent conditions that act as foci of infection. Unfortunately, some patients seek advice after injury has been done, and many, instead of dying from degenerative diseases, develop degenerative diseases because they are dying as a result of the absence of an adequate diet. This point has often been expressed by Price.[6]

In the presence of many systemic conditions, it is advised that infected teeth be extracted and periodontoclasia treated, not with the idea that such infection is a direct factor in the causation of a disease which the patient has, but because it is another barrier to the patient's effort to build up more resistance.

When the question arises as to whether periodontoclasia can be cured, the answer will depend largely on what is meant by

6. Price, W. A.: New Light on Control of Dental Caries and Degenerative Diseases, J. A. D. A., 18:1189-1219 (July) 1931.

"cure," and what is meant by periodontoclasia. Hanke[7] has said:

> This condition may vary from a simple shallow purulent infection to one in which there is a profound involvement of the bone with large deep pus pockets and teeth that are literally floating. Between these extremes one can have almost any condition.

As in dental caries, diet no doubt plays a very important rôle in the etiology of periodontoclasia, the combination of adequate food, right living and good surgery in advanced cases constitutes the most satisfactory treatment.

Although it is obvious that when one writes on such a general subject, only certain phases can be stressed, such a subject should not be considered without reference to diagnosis. In making a dental report, I believe the patient should be present; that there should be sufficient roentgenologic evidence to cover the entire oral cavity; that a history should be obtained from the patient, and that results of the pulp test and clinical findings should be carefully correlated.

When surgical interference is indicated, selection of an anesthetic that will give the patient the best possible result is also an important step. Often, even the specialist is handicapped by not being able to use the anesthetic of his choice.

The method used in extracting teeth should be one that will safeguard the adjacent tissues and one that will make it possible to remove the tooth in its entirety, together with the affected tissue. More attention should be paid to the advantages of employment of the roentgen rays as routine postoperative procedure, for the percentage of roots remaining after extraction is still found to be far too high.

7. Hanke, M. T.: Relation of Diet to General Health and Particularly to Inflammation of Oral Tissues and Dental Caries, J. A. D. A., 17:957-967 (June) 1930.

DISCUSSION

Harry Bear, Richmond, Va.: It is generally recognized that the profession has undergone many metamorphoses and, in the changing order of things, we have new responsibilities. Dr. Gardner tells us of the value of the radio as a means of publicity. This is conceded, and the time is fast approaching when organized dentistry may use this method extensively for the promulgation and dissemination of scientific truths concerning this profession; and in a manner for ready consumption by the public. The question of pulpless teeth and periodontoclasia focuses attention on a controversial subject. It is no longer debatable that many of these conditions are foci of infection and responsible for various systemic diseases. But, as Dr. Gardner reminds us, how much are we as a profession doing to prevent the ravages of these processes? Why must we continue to treat diseases when so much might be done to prevent them? In keeping with other branches of medicine, dentistry is contributing liberally to the researches in this field. Dr. Gardner says that nutrition and diet are fundamental factors in the prevention of dental disorders. Investigation in these studies has been most enlightening though not as yet conclusive. It behooves us to be conservative, yet progressive. The eagerness with which we seek methods for the prevention of dental caries, etc., may lead us to depend too much on nutrition if we accept this as the sole basis of the condition. It is not within the province of the dentist to prescribe the diet for patients with systemic disorders, such as diabetes and duodenal ulcer, as this belongs to the field of the physician. Of course, intelligent cooperation of the dentist and physician is highly desirable. Too much importance cannot be attached to the care that should be taken in making roentgen-ray examinations. Cleanliness and asepsis should be fundamentals in every dental office. It should not be necessary to remind the progressive dentist of this any more than it is necessary to tell him that instruments must be sterilized. Dr. Gardner, discussing the functions and responsibilities of dental colleges, says that the schools should encourage instruction to graduates. The growing need for this method of instruction has been met by a number of schools, and, I am sure, more work along this line will be done as the exigencies of the occasion may

require. There is an old adage which, if paraphrased, would say that you can offer these courses of instruction but you can't force the practitioners to attend them. In speaking of dental education, Dr. Gardner states that the faculties of dental colleges have another responsibility in the selection of students. He says: "Dental students should possess some inherent traits: the personality and ability to look and act the part of a dentist, besides intellectual capacity, craftsmanship and mechanical ability." These are splendid ideals, but as one vitally interested in the selection of students, I wonder how the possession of these inherent traits would be determined with the methods now at our disposal. Every school wants to select the best type of student possible. If this sort of test had been applied, I dare say that many of the well-known, highly trained and capable dentists in this room today would have been denied admission to the study of dentistry. How many of you possessed these inherent traits before studying dentistry and looked the part of a dentist fifteen, twenty or twenty-five years ago? It must be borne in mind that the standard of a profession does not rise above the level of the average, and it is therefore the average which we must seek to elevate. I agree with Dr. Gardner that we have responsibilities concerning public health. There is need and there is opportunity. Our efforts must be individual as well as collective.

Carlos H. Schott, Cincinnati, Ohio: The responsibility of the profession concerning health is one still to be accepted by the majority. The emphasis placed on the many phases of that responsibility is timely, and I wonder if the public is not being educated just a little bit ahead of the profession. The many truths brought out by Dr. Gardner leave little to disagree with, though many things may be amplified. I want to emphasize the statement that the dental profession has an added responsibility with the ever-increasing knowledge going directly to the public regarding dentistry, and may I, in this connection, digress from the discussion for a few minutes to tell you how we in Cincinnati are trying to prepare both dentists and the public? We are now conducting a six month mouth hygiene campaign. Sixty-five of our dentists have taken a course in training to give from 150 to 200 lectures this fall to parent-teacher associations, civic clubs and noonday luncheon clubs. Twice a week, there are to be thirteen-minute radio talks given. Boy Scout, Girl Scout and Girl Reserve organizations have been enlisted to promote the mouth health program and there is also to be daily newspaper publicity on the subject. Our plan is to present dependable information regarding mouth health. You can readily see that this intensive work on the part of the dentists is bound to be beneficial to the profession as well as to the public. We expect to develop the interest of our citizens in clean mouths, and next March, in addition to being recognized as the best governed city in the United States, we hope to be also known as the "City with the Cleanest Mouths," and right now we invite other cities to compete with us. Dr. Gardner's statement regarding dental colleges are to the point, only I would go farther in making a selection of dental students, insisting that no student be allowed to enter without a complete dental as well as a general physical examination. If unhealthy mouth or defective tooth conditions existed, he would be required to place the mouth and teeth in the best possible condition and to prove that he knew how to keep them in such condition before he would be allowed to continue study. Then, at least, we should have a profession practicing the things that we advocate for the public and we should command a greater respect than we do now. That preventive dentistry is not practiced by the majority is due to the fact that they think it is not remunerative, but that is all "in their minds." The public is receptive and willing to pay for effective health service. The following admonition was copied from Pierre Fouchard's original manuscript, written more than two centuries ago: "It is very necessary to clean teeth after each meal with water, for without this expediency they would decay." Thus, prevention was stressed long before the advent of modern dentistry; and still too few dentists appreciate prevention. Dr. Gardner takes up the matter of diet, which is of vital importance; but as yet there are too many adverse opinions as a result of researches for us to be satisfied with the situation, but it is encouraging to know that dentists have contributed greatly to this special research. The deductions that we might make are that an excess of carbohydrate, especially sugars, is to a very great degree responsible for the increase in the decay of teeth, especially since this excess of

sugar lessens the appetite for fresh vegetables, fruit and milk, which are the most important calcium vitamin carrying foods. Now as to the pulpless teeth problem, and it is a problem, I grant that the wholesale extraction of all pulpless teeth advocated by many of the large hospitals and oral surgeons is justifiable if the resistance is low and the patient cannot get intelligent treatment. Many of the most radical men admit that not more than 50 per cent improve in health after the removal of the teeth. Carefully selected cases are treatable and can be made reasonably safe with regular check-ups. There are many cases in which I believe the effect is worse if the patient has the teeth taken out and worries himself sick, with or without appliances, than if he retains the teeth, with the concomitant chances. Since it is an approximate 50-50 chance, I lean toward the conservative point of view after thirty years of experience and observation; but remember that I said "in selected cases and conditions, with regular check-ups." When will the profession at large accept the responsibility of preventing, curing or at least arresting periodontal diseases which cause as many teeth in adults to be lost as does decay? I say not until every one of us comes to appreciate periodontia as the fundamental science in dentistry and practice it religiously; to early recognize predisposing causes, general as well as local; and to eliminate these conditions and to instruct our patients as to their care, advising periodic examinations and prophylaxis, and checking up on the occlusion. Most assuredly, the dentists should realize their responsibility in the use of roentgen rays, without which dentistry never would have made the strides it has, though our interpretations vary widely. Every patient should have a full mouth and bite wings films for the checking up of interproximal cavities and cavities under fillings, inlays and bridges. Dr. Gardner's last statement as to the responsibility in extraction is opportune. Since we all know that there is too much carelessness in this field as well as in other fields of operative dentistry, conservation of supporting structures is of great importance as many mouths are ruined for prosthetic appliances. The dentist of today should be in possession of all the knowledge and the facts which will enable him, by advice and care, to prevent transgression of hygienic, physiologic and psychologic laws.

FETISHISM OF NUTRITION*

By RICHARD LOWY, D.D.S., Newark, N. J.

THE title of this paper may seem bizarre perhaps to many of my listeners, yet among the many definitions of the word "fetishism" will be found one applicable to the title, namely, "unreasoning devotion to any object." While we are on the subject of definitions, it is apropos to define "nutrition." It is the process by which living organisms appropriate, modify and utilize the materials necessary for their existence, growth and development.

The fact that the human body is a highly sensitive, regulated mechanism is apparent to all of us. In order to obtain the best possible efficiency, it must be treated accordingly. It is analogous to a machine in that it needs fuel, repairing and regulation.

Briefly stated, the fuel consists of carbohydrates, fats and proteins. These foods also play an important part in other functions. The building and re-

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pairing agents are nitrogen, calcium, phosphate, iron, iodin and magnesium.

The regulators may be classified into two distinct groups, extraneous and intraneous. The former are composed of the mineral salts, cellulose, water and vitamins; the latter are the secretions of the endocrine system.

All the foregoing facts show conclusively that life is not sustained properly and effectively in the absence of any of these substances.

In order that nutrition may be carried on in a healthful manner, certain conditions must be present. The blood must be normal in composition and amount and must circulate with physiologic rapidity; there must exist a certain nervous stimulation and control; the internal glands must be active, and the part to be nourished must be able to appropriate the materials brought to it through the various channels.

The class of patients that are usually found in an orthodontic practice consists, for the most part, of children of families in moderate or fair circumstances. Therefore, it is a foregone conclusion that their diet is composed of the necessary elements for sustenance; namely, butter, eggs, vegetables, milk, etc. In fact, from birth, their diets have generally been under the supervision of pediatricians. One can even look still farther back and be assured that the expectant mother was in the hands of a competent physician. Despite all of these precautions, "deficiency disease" is found.

The question may be asked: Is it possible to standardize a diet formula for the maintenance of life and health? The answer must be *No,* because an individual may be fed a well balanced diet (with the resultant chemical changes involved in digestion, absorption, elaboration and assimilation) and still have the "deficiency disease."

Why? is the next question. This was answered clearly and concisely by Maxwell Lauterman when he said, "Man is what he is by virtue of his endocrine glands." This statement answers the various "whys" with which we are confronted in our offices: Why do children in the same families, fed the same food, living under the same environment, having similar hereditary characteristics, differ totally in the structural consistency and position of the teeth?

Perhaps it is now apparent why the title of this paper is "Fetishism of Nutrition." My criticism is not intended to be destructive but constructive. Before any further discussion, I wish to be clearly understood. I do not wish to leave the impression that nutrition or nutritional research is valueless or nonimportant. The aim of this paper is to bring other important facts to the attention of the profession. The stressing of nutrition is essential, but other conditions which have been relegated to a minor position are of equal importance. The fact that height, weight, figure, form of face, beauty or ugliness and size and shape of bone and teeth are all dependent on the internal secretions must be understood.

The human machine has component assisting bodies which we group and call the general endocrine system. This consists of a series of organs giving off chemical substances called hormones, which, when functioning properly, keep the body in physiologic equilibrium.

The ductless glands or regulators of the body are more or less interdependent. They exert a decided influence in the regulation of metabolism.

A brief discussion of some of the various metabolic workings and disturbances is essential.

Investigation by Elliot and other workers showed that the action of adrenalin from the adrenals is exerted chiefly upon structures that are innervated through the sympathetic nervous system. This suggests the possibility of the existence of an important relationship between adrenal and other glands. In this manner the adrenals might affect metabolism indirectly as well as any other influence that the epinephrin secreted from the gland might have.

In this manner, it is possible to link up the pancreatic gland and its hormone because epinephrin (adrenalin) is capable of producing hyperglycemia. The secretion of the suprarenal (adrenal) glands maintains blood pressure, promotes function and increases strength. Extreme overaction may lead to anger or high temper. The teeth of the suprarenal type are usually well developed and strong but inclined to be yellow.

The hormone secreted from the anterior lobe of the pituitary gland is known to be the growth-stimulating hormone, as well as the hormone connecting with the gonads. As for the posterior lobe, the secretions manifest marked physiologic effects on the cardiovascular respiratory renal, smooth muscle structures. Deficiency in the secretion of the anterior lobe pituitary causes the child to be a symmetric dwarf; early overactivity makes him a symmetric giant.

The teeth in patients having pituitary difficulties are large and square and particularly prone to be irregular and crowded. In fact, to theorize, one might say that in a hyperpituitary or hypopituitary condition during one of the growth periods, without a balancing of the other endocrine secretions, the normal growth of the dental arch and apparatus is either accelerated or retarded, with an asymmetric condition resulting probably in malocclusion.

Diabetes mellitus is a disease of particular interest to the student of dietetics, because it is due to a disorganization of the metabolic processes by which the body utilizes the foodstuffs for the production of energy. Insufficiency of an internal secretion called insulin is responsible for the disorganization of the chemical processes.

The realization that thyroid disturbances are due to a deficiency of iodin almost makes necessary an interpolation of the necessary chemical constituents of the blood stream; but I shall omit that subject for the time being. To sum up briefly the normal action of the hormone thyroxin, one might say that it provides a means for maintaining a higher rate of metabolism than would otherwise be maintained. C. R. Stockard contends that it assists the pituitary hormone in order than an individual's growth may be increased, or that growth may be faster or slower, giving rise to the variations above or below the mean. It may not be alone in its action, but it is the central body tending to control the rate of oxidation and therefore the growth rate.

Falta and Meyers[1] also feel that absence or diminution of the thyroid gland inhibits the closing of the fontanels for a long time, the root of the nose is drawn in and the developing of the bone nuclei is very much retarded. Besides these minor disturbances, mention must be made of simple goiter, cretinism, myxedema and exophthalmic goiter.

The gland which has more or less control of the calcium metabolism, namely, the parathyroid, is of great importance to the profession. This metabolic process, like many others, is dependent primarily on the parathyroid, the endocrine system and nutrition. It has been proved experi-

1. Falta, Wilhelm: Endocrine Diseases (Trans. and edited by Meyers, M. K.), Ed. 3, Philadelphia: P. Blakiston's Son & Co., 1923.

mentally that the gland is directly responsible for maintaining the calcium equilibrium in the blood stream. It is well known that when the calcium drops below 5 mg. per hundred cubic centimeters of blood, tetany results. But the feeding of calcium *per se* is of no nutritive value if the equilibrium of the calcium phosphate has been disturbed. The regulator permits the proper assimilation and final distribution of the minerals to the teeth or bones where required. Thus, one can visualize the softening of the dental structures when there is a parathyroid glandular disturbance and calcium is removed from these structures when needed in other areas. The replacement by the softer mineral magnesium gives rise to white spots and possibly assists greatly in the settling of the malposed teeth recently properly alined; with the resultant failure of the orthodontic procedure.

A discussion of the hormone of the sex glands is complex owing to the fact that not only is it one of the internal secretions but it is also the reproductive element. The hormone secreted by the gonads exerts definite effects during the different periods of life: (1) during embryonic development; (2) at the age of puberty, with the resultant secondary sex characteristic changes; (3) following puberty, when the gonadal secretions have a marked effect on development and general growth until adult size is reached.

An important distinction between the internal secretions of the endocrine glands and the secretion of the gonads is that the latter deals primarily and particularly with reproduction, while the former are more directly concerned with preservation.

There is still a great deal of research necessary as far as gland therapy is concerned. Investigators are attempting to establish the fact of interglandular control and seem to be of the opinion that a definite relationship exists among the various endocrine organs.

Aside from the endocrines, there is one other very important regulator of the body which must be discussed: the kidneys. These organs perform four very definite and important functions: (1) eliminate excess water from the body; (2) eliminate excessive salts (the normal limits of balance of salt both in tissue and blood are very close, with only small variations); (3) eliminate other waste products, particularly nitrogen; (4) assist the body to maintain a balance of the various salts, particularly those which determine the balance of acid and alkali in the blood and tissues.

One can readily see now that though food is necessary for life, other important factors must be considered. Assuming that the food is properly digested, let us go farther. The living body is composed of innumerable cells, each attempting to carry out its allotted task. To each cell, the arterial blood brings the necessary substances, water, foodstuffs, salts and oxygen. Still later, the venous blood collects the products of the cell's activity plus the waste substances. Thus, there must be harmonious and interdependent actions of all the cells of the body, which gives the resultant anabolism and catabolism, or metabolism. In health, Nature is exact and consistent. After food is taken, it must be properly cared for, changed chemically and assimilated, and waste products excreted.

This leads us to a brief review of that all-essential substance, blood, that fluid which circulates through a closed system of tubes and is kept moving by the action of the heart. The blood is the nutritive medium and there is an interchange between it and the tissue cells. The organs

of the body are adjusted to respond to very minute changes in the composition of the circulating fluid, and add to or subtract from its constituents accordingly as these are present in deficiency or excess.

Thus, each villus of the small intestines is supplied with blood from one or two arterioles, which break up into a rich plexus of capillaries lying close under the basement membrane. The blood in these vessels is at a high pressure and circulates rapidly, absorbing from the small intestines lipoids, amino-acids, salts and water. Therefore, it is quite natural that the organs of the digestive tract must elaborate for assimilation the imbibed foodstuffs. Of course, the action of the various digestive juices must reduce the normal diet of man to a state where it can be absorbed by the blood vessels; but here again the nutritional supply is "checkmated" if the metabolic regulators, namely, the endocrines, are impaired or functioning improperly.

All of the foregoing facts tend to prove that proper diet or what you will is not the panacea of all human ailments. The workings of the entire body from the smallest cell upward must be taken into consideration in order that health be maintained.

The fact that proper nutrition is essential is not to be ignored; but the overemphasis placed on certain advertised foodstuffs is a fad. The various catchy slogans regarding the necessary vitamin D, etc., are of no scientific importance. However, it is the duty of every physician and dentist to see that all necessary data are available in order to facilitate the recovery or correction of the patient's ailment. This statement may be clearly stated as follows: All diagnosis must be made along modern chemical and biologic lines.

Therefore, it behooves all orthodontists to refer patients to a competent pediatrician, and have available a complete case history in order that the case may be treated expediently and effectively, with the end-results positive and perfect.

Under the title "The Menace of Psychiatry," Joseph Brennemann[2] says:

> I can perhaps best approach what I mean by the menace of psychiatry by illustration with an analogous situation. The evolution of the artificial feeding of infants was a long, devious and complicated one. A chaos of complexity naturally resulted that has only recently been replaced by a chaos of simplicity. Then, as now, babies were fed with about equal success by any one of a number of methods with which the individual practitioner familiarized himself. In that earlier period it was necessary to observe meticulously the amount of food, the intervals between feedings and the composition of the formula. Percentages and, later, calories were figured so much that some of us no longer like to run across either of these words, and try to keep them dark. There was something awesome, something that inspired reverence, about the word "formula." Its authority was accepted as an article of faith, and its preparation and administration were a sort of household ritual. The present "mixture" demands no such obeisance; it is only one of a lot.
>
> Now, as is well known, a normal gain in weight is one of the essential attributes of growth, and is the best, single, comparative, objective measure of normal physical development that can be expressed in figures. Always duly appreciated as such, at least in infancy, it became a sort of fetish when the campaign directed toward weighing and measuring all children came as an aftermath of the World War. As a natural corollary came the height and weight charts now found in most homes and in the offices of practically all physicians who treat children, except in mine. The scale and the measuring rod became the sole arbiters of nutrition, and the height and weight charts became as fixed guides as if they too had been handed down

2. Brennemann, Joseph: Am. J. Dis. Child., 42: 376-402 (Aug.) 1931.

on tablets of stone from Mount Sinai. While a more or less steady gain in weight, varying with different ages, is a deciding factor in normal growth, it does not of course, follow that all children should weigh the same at a given age, even if of a given height. All of the peas even in the same pod are not of the same size, and there are many different kinds of peas.

The natural effect on the mother when confronted by a standard was to proceed to standardize her child, to make him weigh what he should according to the chart. This naturally consisted in making him eat more if underweight; less, but rarely, if he was overweight. She set about characteristically to do her maternal duty by her child, and struggled heroically and futilely, as every pediatrician knows, to make him eat. Color, tissue turgor and activity, the real measures of nutrition, cannot be stated in comparative figures and so sank into the background. Race and family build had no standing. When she relaxed from exhaustion or a feeling of futility, the school nurse entered the arena as the untiring champion of standardization and the sworn nemesis of the tonsil. And then came vitamins. If there is anything that vitamins are not good for, it has not yet been discovered, but it soon will be. If a little vitamin is necessary and good, more is better, and many and much best. We eat them, we drink them, we chew them, we smoke them; we absorb them with our skins; our foods, and now our laundries are irradiated. Our children wear "sun suits"; our bathing suits are marvelously adapted for absorbing ultraviolet rays on the sandy beach. Zoroaster has come into his own again in these latter days. Our oranges and lemons are "sunkist," our dates are sun dried, our infant foods are bursting with vitamins. Viosterol, which has only one use, but an intriguing name and a better taste, is given to older children as a "tonic," a "concentrated" cod liver oil, instead of the real thing.

Milk, the great "protective food," has been crammed down our throats and our children's throats, in season and out of season, although the observing, practical pediatrician has long known that even in the use of milk, children should be dealt with as individuals and that the slogan of "a quart of milk or more a day" originated in the laboratory, and has a sweeter sound to the milk producer than to the pediatrician. . . .

If the amino-acids had not been so numerous, and had not had such unrememberable names and distribution, they too, might have gotten farther than the abortive stage they once reached. . . .

I am merely pointing out the layman's reaction to all new therapeutic discoveries in medicine that can be popularized and commercialized, and I need not have restricted myself to the layman.

FATAL CEREBROSPINAL MENINGITIS FOLLOWING TOOTH EXTRACTION

By S. W. SHIELDS, D.D.S., Indianapolis, Ind.

History.—R. P., a laborer, aged 29, was admitted to the Robert W. Long hospital, Nov. 17, 1930, in a semirational state. His course was steadily downward, and he died suddenly the next day, November 18.

Three weeks previously, the patient had had a right lower first molar extracted by the family dentist under local anesthesia. Pain in the vicinity had been felt since that time, gradually increasing in intensity, and, two weeks later, the neck became quite painful and slightly stiff. Since that time, the patient had had frequent spells of severe vomiting and had not received much nourishment. A physician was called and advised the family that he might possibly be afflicted with smallpox, but the five-day observation period failed to reveal signs of rash. The temperature at this time was around 100 F. It was said that his present and past health was good. His weight was approximately 175 pounds. He had had gonorrhea, with good recovery. He was married and had three children, all living and well. His father and

mother both died at the age of 48, with what was diagnosed as tuberculosis of the bone.

Examination.—The right lower molar area showed signs of a recent extraction. The socket was filled with a semisolid white slough, and appeared not to have started the process of granulation. There was tenderness on pressure, but little pus was found. The right jaw was moderately swollen. The pupils were small, and reacted to light. No pathologic process was found in the nose on superficial examination. The neck showed no posterior adenitis, but marked anterior adenitis and rather a marked rigidity throughout. Painful impulses were felt on moving the head from side to side.

The remainder of the physical examination was essentially negative. Blood culture revealed *Staphylococcus albus*. Culture of the spinal fluid was negative, as were smears. The Widal test for possible typhoid gave negative results. The Wassermann reaction was 2 plus (antigen 1) and 1 plus (antigen 2), Kolmer technic. The complement fixation tests for the gonococcus and tubercle bacillus were negative. The Gold curve was 1112221000. The test for spinal sugar showed 29 gm. of glucose per hundred cubic centimeters of spinal fluid (method of Folin).

Treatment.—Orders were given for bedside isolation; a high caloric soft diet; sodium salycilate 15 grains, sodium bicarbonate 20 grains, and methenamin, 10 grains, three times a day; a hot normal saline mouth wash, every hour; morphin, one-sixth grain, as required; absolute rest in bed, and forced fluids.

The patient was sent immediately from the admitting room to the ward, and was so violent on arriving that restraint was necessary. A spinal puncture was made and 10 c.c. of antimeningococci serum was injected intraspinally.

At 9:30 p. m., a marked parotitis developed on the right side and the general condition became much worse. Spinal puncture was repeated, the pressure being 40 mm. Forty cubic centimeters of fluid was removed and 20 c.c. of serum injected. As the intradermal skin test was strongly positive, no serum was given intramuscularly or intravenously. Possible diagnosis of brain tumor was considered at this time, but in view of the fact that the present illness was associated so closely with the tooth extraction, a diagnosis of meningitis was made.

At 9 o'clock the next morning, spinal puncture was repeated, the pressure being reduced from 41 to 4 mm. Breathing was of the Cheyne-Stokes type when the pressure was lowest.

Course.—Early that night, the patient was slightly cynotic, and became unconscious, and mucous rasping could be heard in the throat. The parotitis became worse, and indurated, and the breathing was stertorous. At 10:30, 25 c. c. of yellow and turbid fluid was withdrawn. Breathing at this time seemed a trifle easier and injection of 20 c.c. of serum was started. The patient revived slightly, then relapsed. Artificial respiration, injections of caffein and the injection of epinephrin hydrochlorid directly into the heart failed to bring forth any response. A small amount of bloody fluid poured from the mouth. Artificial respiration seemed to indicate no respiratory obstruction. Death ensued at 11:30.

Postmortem examination confirmed the diagnosis.

RECENT EXPERIMENTS DEMONSTRATING WAX DISTORTION ON ALL WAX PATTERNS WHEN HEAT IS APPLIED*

By T. W. MAVES, D.D.S., Cleveland, Ohio

SINCE the casting process was given to the dental profession in 1907 by W. H. Taggard, we have had many different technics advocated by various operators for both large and small piece castings. Although the principles underlying these various technics have in their execution differed in certain ways, they have added a great deal toward the progress made in this field.

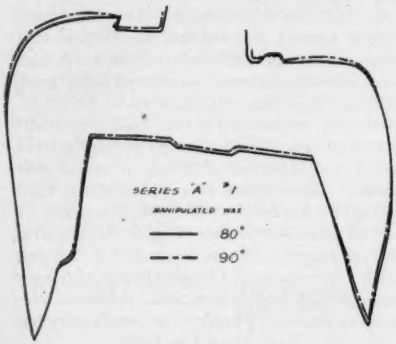

Fig. 1.

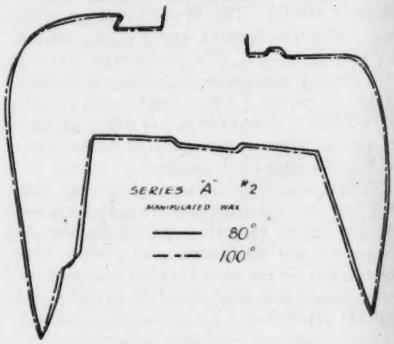

Fig. 2.

In a brief review of all technics, past and present, we note that every man who has presented a technic to the profession has given one or more constructive thoughts to the process of casting. These men have also inspired various groups and members of the dental profession to better, more precise methods and higher ideals. To all those who have so unselfishly given of their time and efforts in uplifting and furthering this art of dentistry, full acknowledgment and credit is due and is given.

We note that the majority of technics used in the past have been built around the apparatus and different materials used in the casting process. This accounts for the variation in technics; the pleasing as well as the discouraging results obtained by some operators, coupled with the inability of certain dentists to carry out the technic according to the specifications.

In our endeavor to make better castings, the variabilities which confront us are numerous, and I know of no better word to impress on our minds the hazards

*Read before the Section on Full Denture Prosthesis at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

which we must encounter. I shall briefly enumerate eight of these variabilities.

1. The great variation in all materials used in casting, with no definite or precise control up to the present day.

2. The difference in setting and thermal expansion of the inlay investment material.

3. The different temperatures applied to the various investment materials.

4. The expansion and contraction of the metal ring used as a container for inlay investments.

5. The effect of spatulation on inlay investments.

6. The lack of heat control for melting the metals in casting.

7. The amount of pressure or force necessary to fill out the mold to prevent distortion.

8. The variations and distortions resulting in all inlay waxes when heat is applied for their manipulation and also the variations in the investing process of the wax pattern.

Added to the foregoing are many others too numerous to mention at this time.

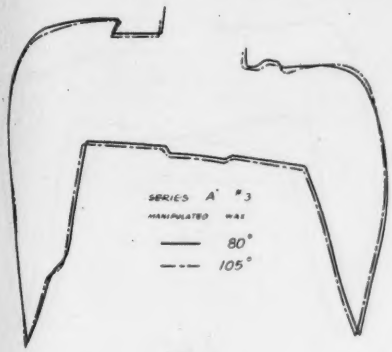

Fig. 3.

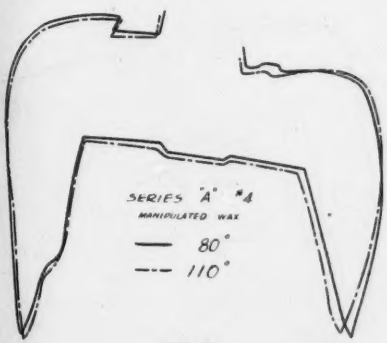

Fig. 4.

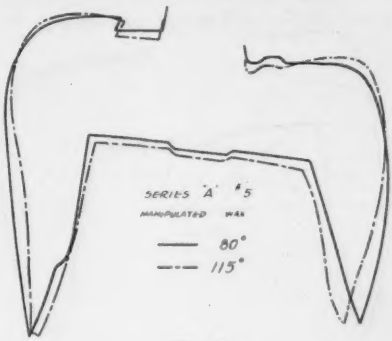

Fig. 5.

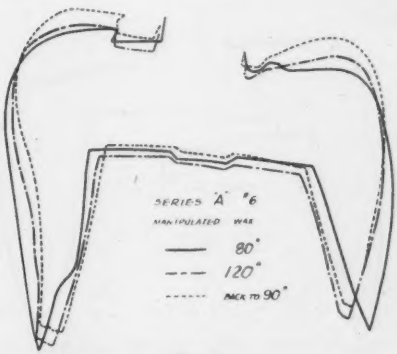

Fig. 6.

The following data present the result of numerous experiments on small inlay wax patterns when heat is applied, showing that all inlay waxes become distorted when subjected to changes of temperature; the distortions varying in propor-

tion to the degree of heat applied.

The apparatus used in carrying out these experiments were as follows: a large magnifying lantern placed in a stationary position 20 feet from the screen with a large water bath containing the wax pattern and a submerged thermometer having an electrically controlled heating element supplying heat to the water bath. Photographs were taken of the tracings of the wax patterns, starting at room temperature, one tracing being superimposed upon another in order to compare the change of the wax patterns at different temperatures.

The wax used in all the experiments was comprised of all the present-day inlay waxes. The experiments were classified into series lettered A, B, C, D and E. In all the series, you will note from two to three lines used in making the various tracings, known as solid line, broken line and dotted line. The mesioclusodistal type of inlay pattern was selected owing to the complicated distortions arising from this type. In studying the illustrations, note that the large magnification of the wax pattern having one pattern superimposed upon the other at different rising and receding temperatures, showing very definitely the change resulting from room temperature to various registered rising temperatures, and then, in certain cases, the return to room

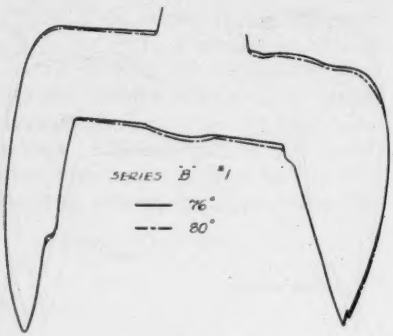

Fig. 7.

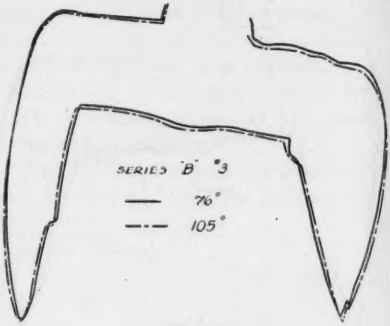

Fig. 9.

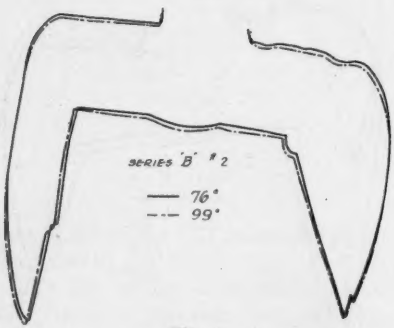

Fig. 8.

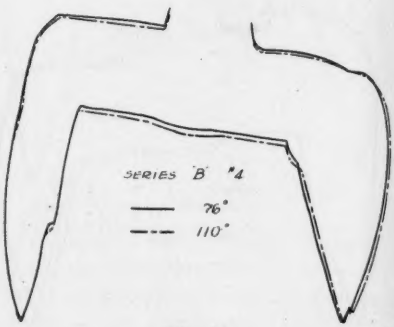

Fig. 10.

temperature. The large magnifications will no doubt be a trifle misleading, but when the wax patterns are reduced to their normal size, the changes are still present and in the same proportions as in the large magnifications.

Reference will be made in the illustrations to manipulated waxes, consecutive expansion of the wax pattern, poured waxes and the location of the sprue pin on the patterns. When wax patterns are made for practical purposes for either the direct or the indirect method in dentistry, the wax must be softened, stretched, compressed and molded in the desired form of pattern. These will be referred to as manipulated waxes, and it must also be borne in mind that manipulated waxes are used more in making the various small patterns than are poured wax patterns.

In series A, 1, you will note that the mesioclusodistal wax pattern was made by manipulating the wax as referred to above, the solid line representing the pattern at room temperature or 80 F. Heat was applied to the water bath until 90 degrees was reached, at which time a tracing was photographed, superimposed on the room temperature tracing of the solid line. In comparing the change from 80 to 90 F. in the pattern, you will note that we have a shrinkage on the right gingival aspect from the solid to the broken line, but practically no change on the left gingival; with a change on the pulpal wall as well as a thickening of the occlusal surface. While the left gingival

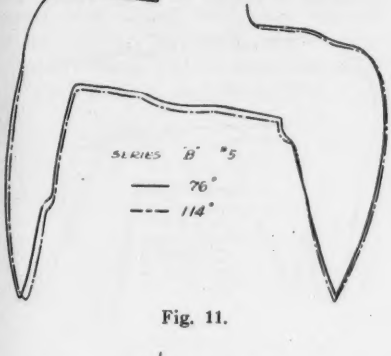

Fig. 11.

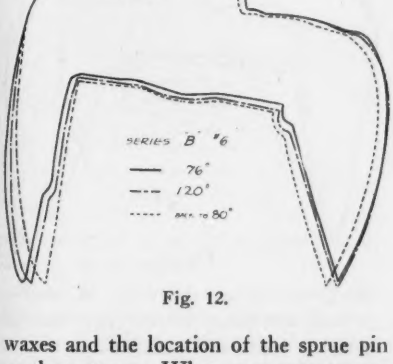

Fig. 12.

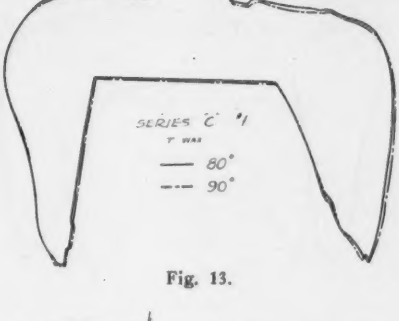

Fig. 13.

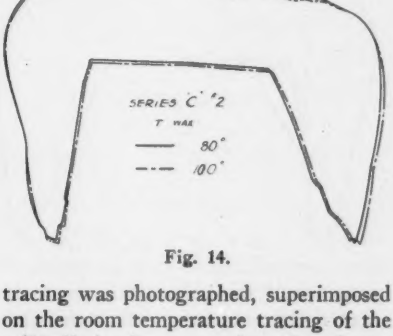

Fig. 14.

wall would fit the cavity, the right gingival would be short, a distortion of the wax pattern resulting, and lack of uniformity of expansion, when only ten degrees of heat was applied.

Series A, 2, shows the same pattern carried at 100 F. in comparison to room temperature at 80 F., a decided shrinkage toward the axial wall on the right side resulting, and an expansion on the left side with a decided thickening on the pulpal wall from the solid line to the broken line. Again, a definite increased distortion results with an addition of 10 degrees (F.) and the absence of uniform expansion.

Series A, 3, 4, and 5, represent the difference in a decided distortion at 105, 110 and 115 F., the distortion increasing as the temperatures were increased on the manipulated waxes from the solid lines to the lines that are broken.

Series A, 6, displays the same wax pattern carried from room temperature, 80 F., solid line, to 120 F., broken line, and allowed to cool back to 90 F., dotted line. It is self-explanatory that as the temperature was increased to 120 F., distortion was greatly increased, plus a twisting distortion on both the right and left gingival walls, and when it was allowed to retreat to 90 F. (the dotted line), a decided shrinkage as well as twisted distortion of the right and left gingival walls still remained.

In the past six numbers of Series A, it can be stated that the distortion of manipulated waxes is not dependable because it cannot be controlled so as to occur in any particular place or area.

Series B, 1, 2, 3, 4, 5 and 6, and Series C, 1, 2, 3, 4, 5 and 6, represent

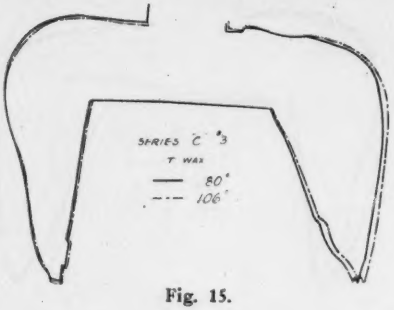

Fig. 15.

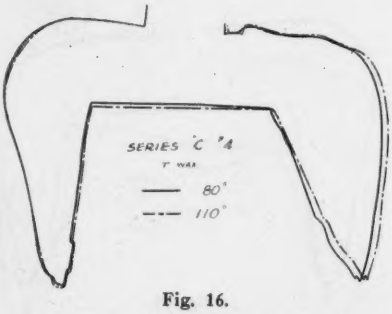

Fig. 16.

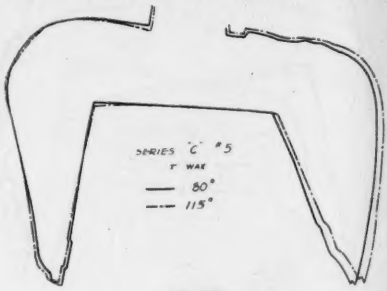

Fig. 17.

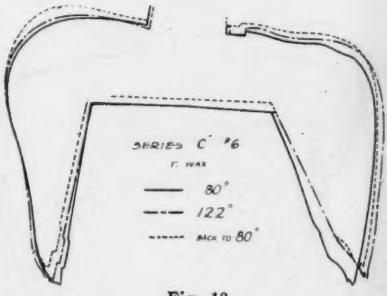

Fig. 18.

patterns of different inlay waxes responding in like manner to Series A. The following statements may be regarded as fundamental:

1. These waxes become distorted with increased temperatures and are not controllable.

2. No two results of tests for distortion ever are alike.

3. Wax, when once expanded (no matter how little), will never return to its previous condition. Even after repeated expansion of the same wax, with the same pattern, and allowed to cool each successive time, the original condition was never resumed.

Series D, 1, 2, 3 and 4, shows the expansion of the same pattern in consecutive periods, proving the third fundamental mentioned above in Series B and C.

In studying Series E, 1, 2 and 3, of poured wax patterns, we will note that distortion remains, but wax that has been poured into form and allowed to cool without pressure has the least amount of distortion when heat is applied. We also find that poured wax patterns will be distorted less with higher temperatures than will manipulated waxes.

In slides F, G and H, the experiments on the location of the sprue pin or leads to the mesioclusodistal pattern when heat is applied resulted in a great distortion of the opposite wall of the pattern from whence the sprue pin was inserted. This can clearly be visualized by studying the figures F and G, also the different changes from 76 to 123 F. in F, and 68 to 116 F. in G.

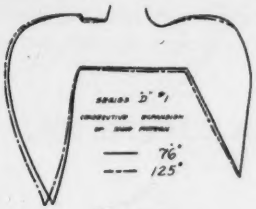

Fig. 19.

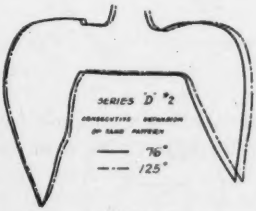

Fig. 20

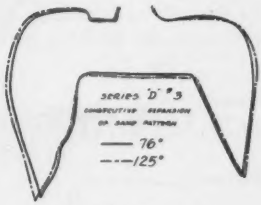

Fig. 21.

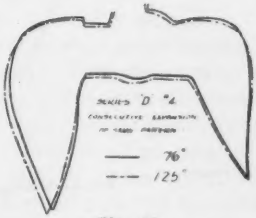

Fig. 22.

In H, the sprue pin was inserted in the center of the occlusal surface, and two wax sprue leads from the main sprue pin to each opposite occlusal angle having three sprue leads to the pattern known here as a braced pattern. When heat was applied at from 68 to 120 F., less distortion resulted than in F and G. Although this was a manipulated wax pattern, we were able to obtain a comparatively even expansion up to 112 F., which resulted in a contraction also, as indicated by the dotted line,

when the heat was increased to 120 F.

In my opinion, the location, size, etc., of the sprue play an important part in the distortion of all wax patterns. Although the last three figures demonstrate

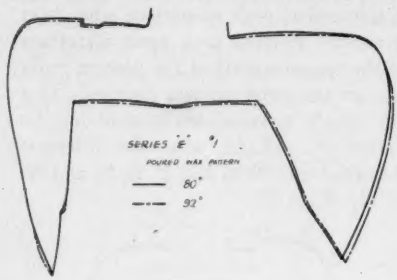

Fig. 23.

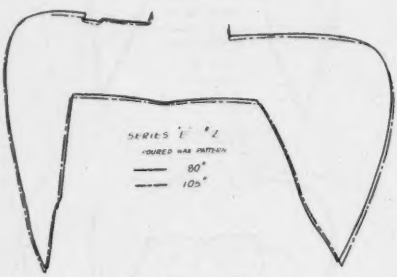

Fig. 24.

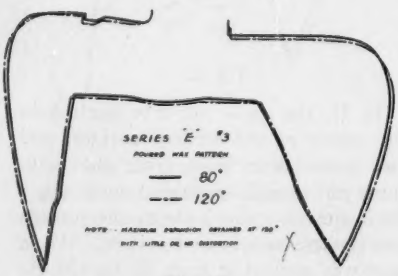

Fig. 25.

clearly the foregoing results, my opinion is offered as an incentive to others to continue the experiments. Additional opinions and results will be very valuable in this study.

SUMMARY

1. All inlay wax when subjected to change of temperature becomes distorted, varying in this respect in proportion to the heat applied.

2. Distortion of present known waxes is not controllable except to a certain extent, as its occurrence in any particular location or area cannot be depended on.

Fig. 26.

Fig. 27.

Fig. 28.

3. No two results of tests for distortion or expansion are ever alike; only an average is possible.

4. Wax which has been poured and allowed to cool without any pressure has the least amount of distortion when heat is applied. Poured waxes permit higher temperatures than manipulated waxes.

5. The consecutive expansion and re-

cooling of a wax pattern does not relieve internal stresses of any inlay wax pattern.

6. Manipulated waxes are distorted more and with less heat than are poured waxes without pressure.

7. There is but one condition under which wax will expand equally; that is, in the case of a perfect sphere, the dimensions from the center to all directions being equal; and then only when the wax has not been subjected to manipulation or pressure.

In conclusion and as a suggestion, may I say that it appears more practical to concentrate our efforts on a technic which will be standardized around the setting and thermal expansion of inlay investments, continuing the use of a cold, thick putty-like mix for the inner walls and surfaces known as a hard core, and casting into a hot mold proven as an expanded mold, rather than depending too greatly on the expansion of wax patterns, resulting in distortion and expansion of no uniformity, as shown by the foregoing experiments.

The data from these experiments are presented to the dental profession with the view of stimulating further research toward the future standardization of small piece castings, and with no criticism for any individual or for any technic employed in the art of casting presented prior to this time.

CUTANEOUS AFFECTIONS OF THE HANDS OF THE DENTIST*

By REUBEN FRIEDMAN, M.D., Philadelphia, Pa.

CUTANEOUS eruptions not infrequently occur on the hands of the dentist. Occasionally, they cause him such annoyance as to interfere with, and at times even utterly incapacitate him from, his work.

The diagnostic possibilities of dermatologic lesions of the hands are legion. Since adequate enumeration and discussion of all of them is obviously impossible within the physical limitations of this paper, it will be restricted solely to the consideration of the diagnosis and prevention of the inflammatory dermatoses. The latter constitute the most numerous, and hence the most frequently encountered, as well as the most important, of all those involving the hands of the dentist. Extended consideration will be given only to those affections in which determination of the etiology usually presents difficulties. The question of treatment must, for lack of space, be omitted.

In a consideration of this subject, it is of prime importance to bear in mind the fact that many inflammatory conditions of the hands of the dentist are totally unrelated to dentistry. In their nature and origin, they are entirely and peculiarly personal rather than professional, having to do with various ill-understood factors in the causation of skin diseases, such as individual predisposition, allergy, atopy and heredity. It is nevertheless true that many inflammatory conditions of the hands which are directly related to

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dental practice are so bound up with various constitutional peculiarities of the individual that, in their consideration, the professional and the personal cannot very well be dissociated from each other. As a matter of fact, the two may be said to be conjoined in a relationship at once so intimate and ramified that it is utterly impossible to set up between them any straight line of demarcation. Since a satisfactory discussion of the one must therefore include the other, attention will be paid to both of these phases of the subject.

For the purposes of this paper, all cutaneous inflammatory conditions of the hands will be divided into two groups, generalized and localized. The first includes those conditions which a careful examination reveals as merely constituting the manual manifestations of dermatoses which simultaneously may and usually do involve many other areas of the body surface. As examples may be cited psoriasis, lichen planus, dermatitis herpetiformis and erythema multiforme. This group, for reasons which are obvious, must here be dismissed without discussion or comment, other, perhaps, than to say that the diagnosis, treatment and prevention of the various dermatoses included therein is largely that of the condition of which the eruption occurring on the hands is only a minor, although integral, part.

The second group includes those dermatoses which apparently are limited only to the hands or to the hands and forearms. It is with the study of this group that this paper is concerned. These dermatoses may be infectious or noninfectious, and, in addition, may, in either case, be nonoccupational or occupational. I may observe here that simple and obvious though they are, these facts are, nevertheless, not infrequently overlooked, sometimes with most unfortunate results.

From the point of view of etiology, the conditions comprising this second group may for convenience also be subdivided in two categories: (1) those dermatoses the etiology of which is obvious, or at least, quickly and easily ascertainable, and (2) those the etiology of which is not so obvious, and is ascertained, if at all, only after painstaking investigation and careful consideration of all the facts.

In the first subdivision belong the following: (1) inflammatory conditions of the skin resulting from physical trauma or irritation, such as incised or lacerated wounds, brush burns, digital and palmar blisters the result of playing golf, tennis and rowing; (2) conditions due to thermal irritation, such as from excessive heat or cold, producing burns, frost bite, etc.; (3) conditions due to undue exposure to the actinic rays of the sun, mercury quartz lamps, roentgen rays, radium, etc.

Dentists occasionally make use of x-ray machines for therapeutic as well as diagnostic purposes. Prof. Howard Fox, of Columbia University, recently presented before the New York Dermatological Society, a dentist who had self-treated a paronychia of his right middle finger with his own x-ray apparatus. Subsequently, the dentist developed marked dystrophic changes of the finger and, at the time of presentation, its condition was such that surgical excision was advised.

In the second subdivision; namely, that composed of those conditions the etiology of which is apparently obscure, belong those dermatoses which are due to the action of either parasitic or chemical irritants. True, a specific etiologic diagnosis may at times be made with little or no difficulty even in cases in this group. Thus, for example, the presence of the burrow in the webs of the fingers is certainly pathognomonic of scabies; and of

the dermatoses due to chemical irritants, neither a poison ivy dermatitis nor a carbolic acid burn of the hands, for example, offers much diagnostic difficulty. Neither do destructive lesions the result of the application of caustic alkalis, erosive acids or corrosive salts such as those of mercury and arsenic. If it is not quite obvious from the objective evidence, surely the history will at once reveal the etiologic factors in these cases.

Usually, the making of a specific etiologic diagnosis in the parasitic and especially the chemical dermatitides is beset with difficulties and achieved finally only after a careful clinical study of the case coupled with the exercise of no small amount of detective ability, plus, in many cases, the cooperation of the laboratory. Even so, its determination, only too frequently indeed, may and does baffle the most astute of clinicians and investigators. It is this phase of the subject, i.e., the making of an etiologic diagnosis in the more important parasitic dermatoses and in those forms of dermatitis due to the action of chemicals and drugs, which will be discussed more at length later on in this paper.

The group of parasitic dermatoses is composed of those due to vegetable and animal organisms. Among the former (adhering to the older standard methods of classification) are included the different varieties of the lower fungi otherwise known as schizomycetaceae or bacteria, i.e., cocci, bacilli and spirilla, and the higher fungi or molds (including yeasts). Each of these varieties will now be given separate, though brief, consideration.

Of the bacterial dermatoses, those due to pyogenic cocci rarely present diagnostic difficulties. Surely, neither a furuncle or boil nor a condition of infection and cellulitis following a wound, nor possibly even a true erysipelas of the hand, need be confounded with anything else; neither need a whitlow or bone felon, or the average pustular paronychia that occasionally results from infection following a manicure. The possibility should be borne in mind that some of the more chronic paronychias may be due to fungus infection and that the initial lesion of syphilis occurring on the dorsal aspect of a distal phalanx may occasionally also simulate an indolent paronychia.

A word of warning is here in order to the effect that pyogenic infections of the hands are not always to be regarded lightly. Mason and Koch have recently observed that "with the exception of furuncles and carbuncles on the dorsal surface of the hands and proximal phalanges there are no infections which so commonly involve these areas as those resulting from human teeth." Not infrequently, indeed, it has happened that a streptococcic palmar fascial abscess, a lymphangitis, or sometimes a tenosynovitis of the hands contracted accidentally in operating on a patient, has resulted in a general septicemia that cost the life of the physician or dentist affected. These are cases which call for expert surgical rather than dermatologic attention, and as soon as possible, too; for, as Kanavel has stated, "the treatment of these three types of infection is essentially different and the gravest of errors will be made if they are not differentiated, since their treatment is diametrically opposed."

Of the bacterial dermatoses affecting the hands and specifically due to bacillary organisms, such as, for example, those of tuberculosis and leprosy, a diagnosis is more difficult to make. Fortunately, these dermatoses, especially the latter, are exceedingly rare in this country, certainly so among dentists, and their consideration need not be gone into here. It may be said that an occasional case has been re-

ported of tuberculosis of the skin being implanted on the site where a tuberculous patient's teeth had inadvertently lacerated or penetrated one's hand. It is therefore not inconceivable that a dentist may be a victim of some such accident. Dental literature records few such cases.

Infection of the hands by spirilla will be discussed at length farther on in this paper.

Of the fungus parasitic conditions that may attack the hands, there are two groups. One, the deeper mycoses, attacking the true skin and subcutaneous structures, includes such diseases as actinomycosis, blastomycosis and sporotrichosis. These again, because of the great rarity of their occurrence among dentists (hardly any cases being reported in the literature), may be dismissed without discussion as to differential diagnosis. The second group, i.e., the superficial mycoses, now commonly referred to as epidermophytosis or eczematoid ringworm of the hands, is one that is being encountered, or at least recognized, with increasing frequency. It will also be discussed more at length shortly.

Of the animal parasitic conditions that may involve the hands, scabies is virtually the only one that need be mentioned but to be dismissed, because the widespread distribution of its lesions, plus the many other clinical characteristics of this disease, makes its diagnosis easy.

Thus, by a logical process of elimination, the inflammatory dermatologic affections most apt to involve the hands of dentists and at the same time present diagnostic difficulties, have here been narrowed down to the following: (1) bacterial parasitic dermatitides due to spirilla; (2) fungus parasitic infections of the epiderm (epidermophytosis or eczematoid ringworm); (3) inflammations of the skin or dermatitides due to various chemicals and drugs. Each of these three groups will now be considered somewhat in detail.

SYPHILIS OF THE HANDS

Infection of the hands by spirilla may be of several specific varieties. Yaws (frambesia), for example, due to *Spirochaeta pertenuis,* constitutes one variety. Since, in this climate, yaws is virtually unknown, it may here be dismissed as merely of academic interest. It is known that the spirillum and fusiform bacillus of Vincent, familiar to dentists as the causative agents in many intra-oral infections, have on occasion been implicated in pyogenic lesions of the hands and have, in fact, as recently reported by Mason and Koch, even been recovered in pure culture from some cases of suppurative lesions of the hands resulting from bite infections.

That type of cutaneous infection by spirilla which is of the greatest practical importance and which occurs with such frequency among dentists, as well as among physicians and nurses, as to give us all the utmost concern is that caused by *Spirochaeta pallida,* the organism of syphilis.

Prevalence.—Statistics on the professional incidence of this disease, unfortunately, are meager, but the reason for this is perfectly obvious. No physician or dentist is willing to have it known that he has syphilis, even though the condition was innocently acquired. That it is far more common than is generally realized may be deduced from some statistics that have been published. Whitney of Boston recently (1928) stated that he had seen twenty-nine cases of syphilis acquired by physicians in the practice of their profession. Berghausen, of Cincinnati, in 1927 reported eight similar cases. Gilbride, of Philadelphia, in 1926 reported five cases

and stated that Osler, while at Johns Hopkins University in Baltimore, had seen ten cases. Such being the sum of the experience of single experts in only four localities, what may the total be for those throughout the country as a whole?

Probably no one is more exposed to the danger of innocently contracting syphilis than is the dentist; for syphilis is never more contagious than when its active lesions occur on mucous membrane surfaces. Dentists should never forget the fact that of all the multiform lesions of the disease, the mucous patch, which may occur anywhere on the oral mucosa, constitutes at all times one of the most potently active of all the lesions of syphilis for the transmission of this disease. Infection of the hands of dentists from contact with oral mucous patches is a not infrequent occurrence. "It has been estimated," states Goodman, "that about 35 per cent of all the chancres of the finger have been found among dentists." "Chancre of the finger," observed O'Leary, of the Mayo Clinic, "is often found on the ring finger of the left hand of dentists who use that finger to retract the cheek."

Prophylaxis.—To prevent digital infections, it is therefore necessary for the dentist, aside from the exercise of proper care of the fingers (i.e., the avoidance of hangnails, fissures around the nails, etc.) and proper technic in the use of hands and instruments, to bear in mind that syphilis is a not uncommon disease and that all oral mucosal lesions consequently should be regarded with a measure of suspicion until their nonsyphilitic nature has been established beyond doubt. It is also well to bear in mind that soap is strongly spirocheticidal. The use of plenty of soap and water for hands that have come in contact with suspected syphilitic material, followed by immersion of the hands in 70 per cent alcohol, or in a weak acetic acid or a 1:2,000 corrosive mercuric chlorid solution, is good prophylaxis.

No cuts nor abrasions of the fingers, however slight, should at any time be disregarded. They should be treated immediately with a strong local antiseptic and suitable dressings. If it is seriously feared that syphilitic infection of a finger has occurred as the result of injury in treating a patient, local antiseptics should be applied immediately, followed by a 33 per cent mild mercurous chlorid (calomel) ointment. Two or three intravenous injections, at forty-eight hour intervals, of 0.3 gm. neo-arsphenamin also are indicated.

Clinical Varieties.—Syphilis is an infectious constitutional disease the cutaneous manifestations of which can conveniently be divided into three well-defined, though usually overlapping, clinical stages, any one or all of which may involve any part of the skin surface. A syphilitic affection of the hands in dentists, as in other persons, may therefore manifest itself by lesions which are characteristic of the primary, the secondary or the tertiary stage of the disease. The real nature of these various lesions, unfortunately, frequently remains unrecognized for much too long a period. Brief descriptions of the outstanding clinical characteristics of the tertiary, secondary and primary lesions of syphilis are therefore given here in order and will be given in the sequence just mentioned.

Tertiary Syphilis.—Clinically, the cutaneous lesion of the tertiary stage of syphilis is either nodular or gummatous, usually unilateral, rarely multiple, with induration or hardness of its border and a tendency to undergo a rather painless ulcerative process with the formation, on healing, of a peculiarly wrinkled and pigmented sort of scarring. The lesions

also show a tendency to a kidney-shaped configuration with central healing and peripheral extension. Occasionally, the tertiary lesion of syphilis may be rather flat, infiltrated and scaly, with a sharply marginated raised border that also tends to assume an arciform or polycyclic configuration. The palmar surface of one hand, occasionally of both hands, is a favorite site for the tertiary syphilid, especially of the type last mentioned.

Secondary Syphilis.—The lesions characteristic of secondary syphilis usually are dull red or copper colored macules or maculopapules with or without scaling. They may remain discrete or form circumscribed patches. Occasionally, the lesions may be papular or papulopustular.

Since distinctly secondary syphilids are always generalized and never confined merely to the hands, and invariably have associated therewith some of the other characteristic concomitant clinical phenomena of the secondary stage of syphilis, the diagnosis can hardly be overlooked by one who is alertly aware of its possibility. Not infrequently, either the squamous secondary or more especially the squamous tertiary syphilid of the hands (because of the latter's relatively few lesions and unilateral distribution) may be confused with an eczematoid ringworm affection of the hand. In the latter instance, fungi may be demonstrated in the scales; there usually are no other related cutaneous, mucous membrane or constitutional symptoms as there are in syphilis, and the serologic tests are negative.

Primary Syphilis.—The cutaneous lesion characteristic of the primary stage of syphilis is the chancre. The early recognition of this initial lesion is of such vital importance to the dentist from the point of view of therapeusis and prognosis that I wish to dilate on its diagnosis. I must say at this point that it is unfortunately also true that infection with syphilis may occasionally take place without a chancre appearing at the point of inoculation (syphilis d'emblée). Thus, not infrequently after a needle prick or cut with a knife point, no initial lesion appears. One is sorrowfully reminded of the otherwise insignificant incident of the needle or knife point prick only after the secondary lesions have manifested themselves.

Diagnosis of Primary Syphilis.—The diagnosis of chancre may be made either clinically or by means of laboratory methods. The ideal way is to combine the two. Stokes, for example, than whom there probably is a no more competent syphilographer in the world, believes that a clinical diagnosis of chancre on any part of the hand (or elsewhere for that matter) is never 100 per cent trustworthy. True, the clinical appearance may be strongly suggestive of chancre, but it is at best but presumptive evidence of syphilis. Generally speaking, the extragenital chancre (and that involving the fingers or hand constitutes no exception to the rule) is but rarely of the classic hunterian type, about the diagnosis of which even, on clinical grounds alone, there usually can be no dispute. Clinically, the extragenital chancre usually is so bizarre and inconstant in its characteristics that it is impossible to describe each variety thereof in detail. Because of this great variability, a clinical diagnosis of extragenital chancre must always be tentative. For the diagnosis to be indisputable, confirmation by laboratory methods is absolutely essential.

Just what, then, it may pertinently be asked, are the clinical, circumstantially incriminating criteria in the diagnosis of a chancre on the hand, and just what are

the laboratory methods that may be employed for confirming clinical suspicion and converting a tentative into an absolute diagnosis?

Clinical Diagnosis.—The most valuable clinical signs are the following: (1) a localized mildly inflammatory, almost painless indurated and more or less superficially ulcerative lesion occurring anywhere below the wrist; (2) a continued slow growth and development of this lesion, which, incidentally, refuses to heal despite the use of various local applications, and (3) an associated painless nonsuppurative, epitrochlear (and perhaps also axillary) adenitis on the same side as the lesions. Cordlike lymph channels between the chancre and the enlarged gland or bubo may sometimes also be demonstrated.

Given this triad of symptoms, a tentative clinical diagnosis of chancre may be made, subject to confirmation through the employment of any or all of the following technical procedures:

Laboratory Diagnosis.—1. The dark-field examination: Immediate confirmation may be secured through this method in approximately 90 per cent of chancres by actually demonstrating the presence of living *Spirochaeta pallida* in the serum obtained from the surface of the lesion. (Serum for similar examination, obtained by suction into a glass syringe through a needle previously inserted in the center of an enlarged epitrochlear gland, may also reveal the presence of living spirochetes).

2. The "local" Kahn test: This should be performed on serous fluid obtained from the surface of the lesion. It has the virtue of being both practically specific and rapid, a report thereon being obtained within several hours if the test is made immediately after the serum is obtained. Furthermore, the local Kahn reaction often is positive far earlier than is the blood Kahn reaction.

A "local" Wassermann test may also be attempted if sufficient serum can be obtained, which rarely is the case. Of the two, the Kahn test is to be preferred, for the reason that it requires less serum and is, perhaps, apt to be more sensitive at this early stage than is the Wassermann.

3. The blood Wassermann test: Reliable and trustworthy though it otherwise is, the blood Wassermann test (as well as the blood Kahn test) is not to be depended on for early diagnosis, which, in the ideal sense of the term, means diagnosis before the complement fixation (Wassermann) reaction has become positive. The interval elapsing between the time that the chancre first appears clinically and the time that the blood first reacts positively to the Wassermann test may be anywhere from one to four weeks. Obviously, then, to wait for a positive blood Wassermann reaction before committing oneself to a diagnosis of syphilis is as unnecessary as it may be ruinous. For, be it remembered, the patient's one hope for a rapid and permanent cure, if cure there be, lies in the immediate institution of proper treatment in this, the earliest and still seronegative, phase of the disease.

Of the beforementioned tests, therefore, the more important for purposes of early diagnosis are the first two, and of these the dark-field test constitutes the most important. It can be performed quickly by one possessing the little special laboratory training and the paraphernalia, i.e., the necessary microscope and the stage that it requires. O'Leary has stated that "in approximately 90 per cent of all types of chancre, *Spirochaeta pallida* may be recognized with the aid of the dark-field illuminator"; hence the

advisability of having all suspected chancres, and especially the extragenital type, examined in this manner is perfectly obvious.

Let me caution you that the possibility of syphilis should by no means be excluded from diagnostic consideration until the dark-field examination has repeatedly given negative results over a period of days and even of several weeks. Incidentally, I may add that all local dressings other, perhaps, than physiologic sodium chlorid solution should be strictly enjoined during the period in which this search for the spirochete is being conducted; otherwise, the quest is rendered futile.

The necessity, when results are negative, for repeating the dark-field examinations lies, as I have previously mentioned, in the fact that although the blood serum may be Wassermann negative for many days in the early stages of development of the lesion, the surface of the lesion itself may, under favorable local conditions, be teeming with spirochetes. The incalculable value diagnostically, therapeutically and prognostically of this method of examination is, therefore, perfectly obvious, as likewise is the necessity of avoiding all local applications that would tend to destroy its diagnostic efficiency.

ECZEMATOID RINGWORM OF THE HANDS

Eczematoid ringworm, or epidermophytosis, of the hands is not an uncommon disease. It is found in people in all walks of life and perhaps more often among those of the higher social strata. It may be contracted by auto-inoculation from foci of infection elsewhere on the body surface, especially the feet or groin; also from contact with infectious material on towels, door knobs, gear shift tops, golf club handles, etc. Handshaking has also been accused as a source of transmission. Once acquired, the condition is characterized by a marked obstinacy and resistance to treatment. Recurrences after apparent cure are frequent. Prophylaxis is obviously difficult. Frequent and liberal use of soap and water is as good a prophylactic measure as any.

Until relatively recently, the real nature of this condition had been unrecognized. Today, it is being diagnosed more frequently because there is greater recourse to the microscope for diagnostic assistance. Indeed, its identity usually is so completely masked by the close resemblance that this dermatosis may bear to many of the clinical varieties of simple dermatitis or eczema, and even to some of the syphilids, that a differential diagnosis is difficult, if not impossible, without the revealing aid of the microscope. Even the great French syphilographer Fournier stated that he knew not how, clinically, to differentiate the palmar syphilid from eczematoid ringworm.

Eczematoid ringworm of the hands and, incidentally, also of the feet, had already received sporadic attention in Europe for several decades before interest therein was first stimulated in this country in 1916 by the work of Ormsby and Mitchell. Today, interest in this disease is widespread throughout the nation.

Laboratory Diagnosis.—The facility with which a simple laboratory procedure may confirm one's diagnostic suspicions has, no doubt, contributed largely to our increasing knowledge of this condition. Thus, by scraping some scales from the periphery of an involved patch onto a glass slide and adding thereto several drops either of a 10 per cent sodium hydrate solution or of Cornbleet's sulphid solution, then covering with a cover slip and examining the specimen, after the lapse of half an hour or more, under the

low power objective of a microscope, we shall usually discover the mycelia and spores of the pathogenic fungus, if present.

Differential Diagnosis.—The finding of ringworm fungi in the lesions of various conditions showing a predilection for the hands has upset many old established ideas concerning the real nature and identity of these lesions. For example, such conditions as the so-called eczemas due to excessive sweating (dyshidrotic eczema, cheiropompholyx, pompholyx, etc.) wherein deep-seated vesicular lesions occur, especially on the fingers and palms, have so often been found to show fungi in the epidermal roofs of these vesicles that many dermatologists now no longer consider such conditions as eczemas or dermatitides due to disturbances in the mechanism of sweating, but as eczema-like eruptions due to ringworm infection; in other words, eczematoid ringworm.

So frequently, in fact, have cutaneous lesions of the hands been demonstrated to be of mycotic origin (i.e., due to yeast fungi as well as ringworm fungi) that any such hitherto common and unquestioned diagnosis with reference to lesions of the hands such as the above-mentioned dyshidrotic eczema or pompholyx, vesicular, pustular or squamous eczema, occupational dermatitis, uric acid or gouty eczema, nervous eczema and constitutional or diathetic eczema, when made today, is regarded by dermatologists with a great deal of skepticism, especially so if no pains had been taken to scrape the lesions and examine the scales, and particularly the removed epidermal roofs of some vesicles or pustules, if present, for the telltale mycelia and spores. In some cases, it may be necessary to culture the scrapings in some specially suitable medium, such as Sabouraud's, in order to demonstrate the fungus character of the affection, since not infrequently apparently negative scales yield positive cultures. The fact remains that any and all of the above-mentioned "diagnoses" are today deemed untenable, to say nothing of their acceptability, unless the possibility of their mycotic origin has first been ruled out by microscopic and, if necessary, cultural investigation.

Epidermophytids.—The hands, on occasion, may also be afflicted, sometimes as part of a generalized process, with either a maculosquamous, lichenoid, papular or discrete vesicular eruption which is unique in that it always is secondary to and associated with a more or less acute ringworm infection (epidermophytosis) elsewhere on the body surface, usually on the feet. Although scrapings from the latter foci may be invariably positive, those from the secondary lesions are consistently fungus negative on repeated examinations. Bloch and Jadassohn, in Europe, and Williams in this country were the first to call attention within recent years to this condition, to which they gave the name epidermophytid. Epidermophytids on the hands and elsewhere have been explained by these authorities as allergic manifestations, the result of sensitization of the skin of the hands by a primary acute focus of ringworm infection elsewhere, the changes in the hands being due to the hematogenous transport of spores, mycelia or toxins (?) from the primary foci (usually on the feet), and their localization in the hands.

Physicians now are alive to the fact that a vesicular outbreak on the hands may possibly be an epidermophytid eruption. The dentist, therefore, need not be surprised, if, on consulting his family physician regarding some such acute outbreak on his hands, he should be asked to remove his shoes and socks for examination of the feet and toes. Indeed, the

modern dentist, under the circumstances, should perhaps both expect and demand that his feet be examined.

I may digress here to remark that, like many another fetish in medicine that has a certain percentage of truth in it, the matter of examining a patient's toes because of a number of little blisters on his hands may be grossly overdone and thereby unjustly laughed into disrepute. No one, for example, knows better than the dentist, cooperating as he does with the physician in the search for the etiology of various aches and pains which the latter's patients complain of, how far afield the search for foci of infection may go; and, incidentally, how many myriads of good, fair and even bad teeth have needlessly and futilely been sacrificed on the altar of focal infection, to the discredit of the latter as well as of the physician and the dentist. Deplorable as this may be, who will deny the reality of focal infection and its relationship to other disease processes? Judgment and discretion, indeed, are handmaidens of scientific medicine that should never be discharged in favor of the undiscriminating enthusiasm that is characteristic of the faddist. Although the latter may needlessly subject one to procedures that are both futile and embarrassing, it is none the less true that the discreet and judicious exercise of scientifically indicated methods of examination may often be conducive to the establishment both of a correct diagnosis and cure, than which, I am sure, there is nothing more desirable. And failure to examine a patient's feet, in the presence of certain atypical eruptions on the hands which dermatologists now regard at least tentatively as epidermophytids is not infrequently sure to mean failure in the diagnosis and rational therapy of this condition.

In any event, it should be clear from the foregoing facts that eczematoid ringworm and its allied conditions constitute highly important and not infrequently encountered cutaneous affections of the hands. Their diagnostic possibility must always be borne in mind whenever the problem of a differential diagnosis of a cutaneous inflammatory affection of the hands of a dentist is under consideration.

DERMATITIS OF THE HANDS DUE TO THE USE OF CHEMICALS AND DRUGS

Nothing could be more natural than for dentists first to cast suspicion on something associated with their occupation as being responsible for whatever inflammatory cutaneous affections may happen to involve the hands. In view of the innumerable varieties of irritants to which dentists may be exposed nonprofessionally and to which they just as well as the rest of us human beings may become victims, the truth of the matter probably is that their occupation plays a relatively infrequent rôle in the causation of such affections. Nevertheless, since professional dermatitis in dentists is, indeed, a very real entity, the why and wherefore thereof, as well as the matter of its prophylaxis, properly comes within the scope of this paper.

The above-mentioned questions relative to inflammatory cutaneous affections of the hands, as is also true, for that matter, of the why and wherefore of *any* dermatitis regardless of its location, and, in a broad sense, true, too, of all disease, may be answered as follows: 1. The patient's constitutional condition, for various and sundry reasons which we need not go into here, is such that it serves as an underlying or predisposing cause to cutaneous disease. 2. The patient's skin, as may be true also of his teeth or lungs or liver, or whatever organ happens to be diseased, has also, for various reasons,

congenital, acquired or both, an altered biophysicochemical tissue reactibility which renders that tissue susceptible to the contraction of disease. 3. The patient comes in contact with an irritant, known or unknown, organic or inorganic, exogenous or endogenous, animate or inanimate, specific or otherwise, acting directly or indirectly, which precipitates that reaction in the patient and his tissues which we recognize as disease.

To understand the foregoing general principles, therefore, is also to understand the why, the wherefore and, incidentally, the prophylaxis of a professional dermatitis such as may occur in dentists.

I have intimated that the average professional dermatitis of the hands is, as a rule, the result of sensitization, usually acquired. In the consideration of this subject, it is necessary at the same time not to lose sight of the important fact that skin sensitization may be nonoccupational as well as occupational in origin.

After all, the number of possible irritants to which a dentist is exposed professionally is more or less limited; nonprofessionally, it is virtually limitless. Weber, for example, recently published a partial list of about 453 known cutaneous irritants, including irritating plants, hair dyes, hair tonics, cosmetics and related miscellaneous substances and various unclassified cutaneous irritants. In view of even this incomplete list, it behooves one not to be in too great haste to make a diagnosis of occupational dermatitis in a dentist merely because the latter's hands show some signs of inflammatory reaction.

Procain Dermatitis.—Judging from the dental literature on the subject, it would seem that most cases of professional dermatitis in dentists are due to procain. But little attention evidently has been paid to, and in fact very little mention even can be found of, forms other than procain dermatitis. Indeed, it would seem that the very term "professional dermatitis in dentists" is held to be synonymous with "procain dermatitis," unless otherwise specified. This apparently is due to the fact that procain is the local anesthetic most commonly used by dentists. Procain has irritant properties. Since the irritating effect of this drug on certain skins is a proven and accepted fact, "procain dermatitis" is therefore justly entitled to its established position as a cutaneous etiologic entity peculiarly common to dentists.

In general, it may be stated that the frequency of occurrence of procain dermatitis in dentists is rather an exaggerated and overrated one. That procain, furthermore, has often been unjustly accused of being the causative factor in a dermatitis, the mere accusation not infrequently being accepted without question or proof, is unfortunately also true. A careful investigation of all cases of so-called procain dermatitis undoubtedly would reveal other factors than procain as the etiologically responsible agents in a large proportion of them. Substantiation of these statements may be found in the recorded experience of eminent authorities.

Thus, in 1922, Hermann Prinz, professor of pharmacology at the school of dentistry of the University of Pennsylvania, was quoted by Gaskill[1] as follows:

> We use about twenty-five or more quarts (of procain solution) per year in our various clinics, and we have never seen a single case of skin irritation or other disturbances of a

1. Gaskill, H. K.: Procain Dermatitis Among Dentists, Arch. Dermat. & Syph., 6:576 (Nov.) 1922. Questionable Novocain Dermatitis Among Dentists, Dent. Cosmos, 64:310 (March) 1922.

local nature arising therefrom. Many dentists keep their syringes and needles immersed in various types of antiseptic solutions which contain cresol, alcohol, formaldehyd, boric acid, benzoic acid, alkalies of various types, and other compounds. When they use the syringe they remove it with their hands, which possibly always means more or less contamination with these preserving solutions, and I assume that some of the so-called anesthetic dermatitis may most likely find an explanation therein, although I do not deny that isolated cases of procain dermatitis may exist. Personally I have used procain since its introduction into dentistry in 1907 in many thousands of cases, and I have not seen any single skin reaction therefrom. I have employed it to a very limited extent in powdered form directly upon wound surfaces in the oral cavity, and have never seen from it any ill results.

I have had a number of cases of severe skin irritations observed on the fingers of dentists, and in all of these cases I was able to trace the origin to the careless use of formaldehyd, which is so freely employed by dental practitioners in the treatment of infected root canals and also for sterilizing purposes.

In a personal communication of recent date, Dr. Prinz stated:

We are using novocain exclusively for local anesthetic purposes in our institution. We use in average about 40 liters of 1.75 per cent solution in a solvent consisting of 0.7 sodium chlorid, 0.4 potassium sulphate, 100 c.c. distilled water. At the time of using the solution, we add from 4 to 5 drops of suprarenin to each 10 c.c. of solution. In round figures, this gives approximately 15,000 injections per year. During the last eight years, I have seen only one case of procain dermatitis in a student. His skin reaction showed that it was a true case. After using various salves, mild x-ray treatments on the hands were applied with success. In the meantime, this doctor still uses procain with apparently no particular precaution as far as his hands are concerned, and so far no returns have occurred.

In general European dental literature, very little reference is made to procain dermatitis. Most cases of occupational eczema on the hands of dentists can be traced to the use of such drug compounds as formaldehyd, cresol, lysol, methyl alcohol, etc. Such cases are by no means rare.

Silber,[2] of the Institute for the Study of Occupational Diseases, in Leningrad, recently undertook a series of exhaustive clinical and experimental studies on the relationship of procain to cutaneous affections of the hands in dentists. Nineteen dentists were studied clinically. Their average age was 39 and average dental experience, sixteen years. All of them had, for at least one and one-half years prior to this study, been doing none other than extraction work in the various dental clinics with which they were associated. For local anesthesia, all of them used a 2 per cent solution of procain containing 1 drop of epinephrin per cubic centimeter of solution. Each dentist averaged from thirty to forty extractions a working day.

Cutaneous affections of the hands were found in fifteen of the dentists. In twelve of them, no relationship whatever could be established between the affections on the hands and the use of the procain solution. In three of the fifteen dentists, a possible though doubtful relationship between the two could be conceded.

Silber concluded that the various cutaneous affections of the hands of these dentists were due not to sensitization to and irritation by procain, which, from his experimental studies, he also concluded is allergically inert, but rather to the oft repeated washing of the hands, plus irritation thereof from the use of soap and hand brushes. He found that other contributing factors of no small importance in the production of these affections were the irritation of the skin of the hands by the "disinfecting" solutions in which they were immersed, and the tendency to dry

2. Silber, D.: Gibt es eine Novocain dermatitis als eine Berufskrankheit der Zahnärzte? Deutsche Monatschr. f. Zahnheilk., 46:338, 1928.

the hands incompletely after withdrawal therefrom or otherwise washing them. Contact of the hands with instruments still wet from immersion in strong solutions of soda, etc., was also found to be an associated factor in the genesis of these affections.

Although the conclusions of the abovementioned authorities are in virtual accord in that both Prinz and Silber attach to procain little or no pathogenic properties as far as cutaneous disturbances of the hands are concerned, they afford a marked contrast to the tendency noted as generally prevailing among the rank and file of dental practitioners to argue cause from effect, and hence to blame procain primarily for every dermatitis that affects their hands.

That the logic of the latter, or *post hoc ergo propter hoc,* method of reasoning is fallacious and liable to lead to errors in diagnosis is quite obvious. I need but cite the series of cases reported by Gaskill[1] of supposed procain dermatitis in dentists in order to prove the point.

Thus, of a total of nine cases in dentists, all of whom came to him with a self-made diagnosis of procain dermatitis, Gaskill found on investigation that the dermatitis in one dentist, though probably due to procain on one occasion, was due on another to the use of a medicated shaving soap, and, on still another occasion, to the use of tincture of green soap for washing rubber gloves and then hanging them up to dry. The dermatitis in another dentist was found to be due to contact with poison weeds; in a third, to tomato plant sensitization; in a fourth, to poison ivy; in a fifth, to ringworm infection, and in a sixth, to formaldehyd. In the three remaining, the dermatitis was assumed to be due to procain, although not definitely proved to be so in all of them.

At any rate, from the abovementioned observations of Prinz, covering a period of about twenty-four years; from the case reports of Gaskill, and from the clinical and experimental investigations of Silber and of Nipperdey,[8] it is clear that strong doubts may be entertained as to the degree of authenticity to be attached to diagnoses of so-called procain dermatitis.

(Nipperdey questions the existence of a true "novocain" dermatitis and furthermore observes that the reported cases of dermatitis seem to follow the use in America of procain rather than of novocain. At least, that is the substance of the reply made to him by the German manufacturers of "novocain" in response to his inquiry relative to the cutaneous irritant properties of the drug.)

Nevertheless, procain dermatitis must be regarded as a proven fact, proven clinically beyond question by the case reports of such observers as Lane,[4] Klauder,[5] Haas,[6] Highman,[7] Beck[8] and numerous others, and substantiated experimentally in various ways, including positive skin sensitization tests, as in the cases reported

3. Nipperdey, H.: Novocain-Eczeme? Zahnärztl. Rund., 37:289, 1928; abstr. Deutsch. Monatschr. f. Zahnheilk., 46:1070, 1928.

4. Lane, C. G.: Novocain Dermatitis in Dentists, Dent. Cosmos, 63:878 (Sept.) 1921. Occupational Dermatitis in Dentists: Susceptibility to Procain, Arch. Dermat. & Syph., 3:235, (March) 1921.

5. Klauder, J. V.: Novocain Dermatitis, Dent. Cosmos, 64:305 (March) 1922.

6. Haas, A. M.: Personal communication citing six cases of procain dermatitis.

7. Highman, W. J.: Procain Dermatitis, Report of Case, Arch. Dermat. & Syph., 4:262 (Aug.) 1921.

8. Beck, H. M.: Novocain Dermatitis Following Faulty Technique in Use of Drug, Dent. Cosmos, 64:869 (Aug.) 1922.

by Lane, Klauder, Ramirez and Eller[9] and other investigators.

It is logical to assume, therefore, that the position which procain occupies as a cutaneous pathogen, though obscured by this conflict of opinion concerning it, must be at some point between the two extremes represented by the studied negativism of Silber and the relatively unstudied positivism of the average dental practitioner. The probability is that the actual position of procain as a pathogenic agent is considerably nearer to the negativism of Silber than it is to the other extreme. I would say that it approximates that of Prinz, which is simply admitting the possibility though denying the probability that procain is the responsible agent in any given case of cutaneous inflammatory involvement of the hands in a dentist.

In connection with Gaskill's previously mentioned group of nine cases of dermatitis of the hands in dentists, there arises an interesting question. In spite of the diversified etiologic factors involved in their formation, how is the clinical similarity of these nine cases to be explained? A similarity so pronounced that had the dermatologist not succeeded in finding the real etiologic agents involved in any of the cases, the most tenable clinical diagnosis in all nine, as in the three last mentioned, would have been "dermatitis of the hands, presumably due to procain."

Other Types of Dermatitis.—The explanation for the clinical similarity of all the above-mentioned cases rests on the fact that dermatitides such as may be provoked by external irritants infrequently present clinical pictures that are specifically pathognomonic of the identity of their etiologic precipitants. This is due to the fact that the possible forms in which the skin may manifest its reaction to irritation are, after all, quite limited; and, paradoxical though it may seem, is also due to the fact that too many factors enter into this reactive process to make for an invariably uniform clinical picture for each variety of irritant. Included among these factors are age, sex, heredity and local and constitutional susceptibility and resistance; degree of sensitization, if any; texture of skin, and topographic location involved. To these must also be added the nature of the irritant or toxin, its concentration or virulence, length of application, etc. These then are some of the variables which govern the morbid picture that constitutes the pathologic response of the skin to irritants, and not only to irritants of widely diversified nature but also to different concentrations of one and the same irritant. That is why procain, for example, regardless of the degree of concentration in which it is presented and even when in saturated or in powder form, has no effect whatever on the skin of most dentists; while, in a few, even a very weak solution may be productive of a pathologic response, which may range from a mild, erythematous process to a papular, vesicular, pustular, scaly, hyperkeratotic or infiltrated and fissured type of process, depending largely on the time factor.

Incidentally, it is well to bear in mind that, dermatologically, exactly the same sort of pathologic process and clinical picture may be evoked by the action of any number of other irritant substances, such as poison ivy, poison weeds, formaldehyd, ringworm fungi, certain soaps, iodoform, mercury and cresol. In other words, the pathologic and clinical response of the skin to external irritants is essentially

9. Ramirez, M. A. and Eller, J. J.: Intradermal, Scratch, Indirect and Contact Tests in Dermatology, J.A.M.A., 95:1080 (Oct. 11) 1930.

more or less the same, regardless of the identity of the irritant. This response is, after all, merely a simple dermatitis. The clinical recognition of the latter as such usually presents but little or no difficulty, although its variations in degree or intensity may at times prove a bit confusing. It is when one tries to determine the identity of the etiologic factor in any given case of simple dermatitis of unknown origin that one often encounters a problem defying his best efforts at solution, and this not infrequently in spite of the employment to that end of all the resources of scientific medicine.

DIAGNOSIS OF OCCUPATIONAL DERMATITIS

If it is admitted that the clinical appearance of simple dermatitis may cover a multitude of etiologic possibilities, how is a specific etiologic diagnosis in cases of occupational dermatitis to be made?

An etiologic diagnosis in cases of occupational dermatitis, whether in dentistry or otherwise, can be made by a process of exclusion, or by the application of the so-called therapeutic test, i.e., abstaining from contact with the suspected etiologic agent. If the dermatitis then disappears and there is no recurrence, that, at least, constitutes circumstantial evidence strong enough to warrant the assumption that that agent is etiologically related to the eruption. Skin sensitization tests with the suspected sensitizing agent can also be used to determine the nature of the condition.

1. Diagnosis by Exclusion: In the process of exclusion, the various common cutaneous diseases must first be considered. The same must be done with reference to the more common nonoccupational irritant dermatoses. It is only when these two groups of diagnostic possibilities have been excluded from consideration that a provisional diagnosis of occupational dermatitis may then be entertained and attention focused first on substances associated with one's occupation and generally known to be cutaneous irritants and then on unknown possibilities.

2. Diagnosis by Therapeutic Test: Occasionally, there is obtainable more direct evidence as to the specific etiologic agent involved in an occupational dermatitis. The dentist himself may have observed that when his hands or fingers come in contact with iodin, iodoform, procain, apothesin, arsenic, mercury, compound solution of cresol (lysol), phenol (carbolic acid), formaldehyd, ethyl alcohol, wood alcohol, etc., a dermatitis develops, usually at the points of contact. He may have noted, furthermore, that he remains free of such dermatitis only as long as he avoids contact with that particular irritant. Such evidence, when obtainable, as, for example, in the case cited by Lane in which his patient was entirely free from dermatitis when he used rubber gloves, but suffered an immediate return of the eruption every time he employed procain without wearing his gloves, constitutes, of course, incriminating proof of a character that can hardly be refuted. The therapeutic indication in such cases, incidentally, then becomes simply prophylaxis, although desensitization may be attempted.

3. Diagnosis by Skin Sensitization Tests: Frequently, a dermatitis of the hands, though apparently occupational, may baffle all efforts to arrive at its etiologic origin through mere processes of deductive reasoning. In that event, the next most rational step in the diagnostic procedure should be to obtain specific evidence through the medium of testing the skin of the patient for sensitiveness to one or more of a series of suspected substances. Though by no means an infal-

lible method, when competently performed and interpreted, it constitutes an invaluable procedure in the determination of the etiology.

The present status of sensitization testing for ordinary practice may be summarized as follows: In a majority of cases, the causative factor can be determined by the combination of intelligent history taking and clinical experience. In that minority of cases wherein sensitization tests have to be resorted to, the following methods may be employed:

(*a*) The Patch or Contact Method. This is superior to other methods for determining susceptibility to external irritants, particularly those of nonprotein structure. This test is usually performed by taking some of the suspected material, applying it to a normal area of the skin of the arm or back, covering the material with an impermeable substance such as rubber tissue, oiled silk or cellophane, and keeping the covered material in close contact with the skin by means of adhesive straps or a suitable bandage for twenty-four hours. Procain solution is tested by means of filter paper or linen soaked with the solution. At the end of this period, removal of the bandage and material will disclose, if the skin is sensitive thereto, an inflammatory reaction of variable intensity. Occasionally, this reaction may be delayed for twenty-hour more hours.

(*b*) The Scratch Method. This has been the most commonly employed. It is useful for the detection of protein as well as nonprotein irritants. With a needle point, a linear abrasion about a quarter inch long is made on the skin, without drawing blood. A small quantity of the substance to be tested is then placed on the abraded area and gently rubbed in with the flat surface of a toothpick. (A drop of decinormal sodium hydrate solution is admixed in testing with a protein substance.) The development, within a half hour, of an urticarial wheal or a marked erythema is indicative of a positive reaction. Control tests, using a physiologic sodium chlorid solution, should be performed at the same time.

(*c*) The intradermal method. This is more sensitive than the scratch method. It is more liable to produce false local reactions as well as alarming systemic reactions, particularly in those highly sensitive to protein irritants. A small quantity of the suspected substance is injected into the skin, i.e., intracutaneously, not subcutaneously. If this is done correctly, a small, circumscribed, blanched area of swelling appears immediately at the site of injection. The subsequent development of an inflammatory papule with surrounding redness is indicative of a positive response. Control tests with physiologic sodium chlorid solution must also be performed.

(*d*) The indirect or passive transfer method. This method has its optimum applicability in cases of hypersensitiveness to certain foods. In cases of hypersensitiveness to external excitants of nonprotein nature, such as procain, this method has but little value. Its description will therefore be omitted.

Interpretation of Skin Sensitization Tests.—A word of caution must here be interposed relative to the interpretation of these tests, to the effect that, like the Wassermann test, a negative reaction does not necessarily mean that the clinical diagnosis must be discarded. Too many factors, which cannot be gone into here, enter into these cutaneous tests and render them far from being 100 per cent reliable. Tests, therefore, that are at first negative should, in strongly suspected cases, be repeated. Even positive tests, for that matter, are not infallible

proof that the agents provoking them are the causal factors in the dermatitis. One may, for example, react positively to procain on a skin test, and yet the dermatitis on the hands may actually be due to poison ivy or something else. In the average case, a positive reaction may generally be accepted as diagnostic unless subsequently proved otherwise.

In those cases in which indefinite or suspicious reactions are obtained to a suspected substance, it is highly important not only to repeat the sensitization tests several times, but also to do so by the use of several different methods. Unless this is done, one is not justified in declaring a patient "negative" to a given suspect. As a concrete example of this may be cited the case recently reported by Ramirez and Eller of the dentist who had a recurrent dermatitis of both the hands and the face for eight months. The scratch and the indirect methods were negative with ethyl alcohol. Ordinarily, one would feel that these tests should suffice. The intradermal and the patch tests were also made and positive reactions to ethyl alcohol obtained. Confirmatory proof of the fact that ethyl alcohol was the actual causative agent in this case was further afforded by the fact that avoidance of contact therewith resulted in disappearance of the hitherto persistent eruption, and renewed exposure caused a recurrence.

These same authors also report four cases of procain dermatitis in none of which was the passive transfer method positive. In only one was the scratch method positive. In another, the intradermal was positive. Yet, in all four, the patch or contact method was positive. It would seem, therefore, that the last is the method of choice, if only one method is to be employed in the detection of procain dermatitis; for, of the four methods used, this was the only one which proved to be consistently successful in eliciting a positive reaction.

It may be well to observe here also that the interpretation of these sensitization tests should be done with a mind open to the possibility of coexisting modifying factors. For example, it should be remembered that there is such a thing as a refractory state on the part of a patient, wherein he will not react even to substances to which he is highly sensitive. On the other hand, there is such a thing as a state of skin hyperirritability during which a wheal or erythema strongly suggestive of a positive reaction may occur for every substance tested, including even the controls. This state of skin hyperirritability may be fairly localized or it may be generalized. It may also be either temporary or persistent. It is obviously impossible in such cases to interpret skin reactions accurately. "Such patients should be put to bed on a limited diet, with free catharsis, as a means to lessen the irritability of the skin, and then tested by the indirect method, using the principle of local passive transfer as demonstrated by Prausnitz and Küstner."

So much, then, for the merits and demerits, the possibilities and limitations of the methods that may be employed in establishing and verifying a diagnosis of specific sensitization in cases of occupational dermatitis in dentists.

CONCLUSION

I have purposely omitted detailed clinical descriptions of the various types of dermatitis that constitute dental occupational dermatoses, such as those that may be produced by procain, formaldehyd or iodoform. This I have done mainly because, as explained previously in my discussion of dermatitis due to external

irritants, it would simply mean going into detailed and unnecessary descriptions of the various morphologic forms that simple dermatitis may assume, which is in itself a task for a book rather than a paper, and also because of the fact that some such descriptions, especially of procain dermatitis, have been appearing with more or less frequency in the dental literature of the past decade or so.

If I have made clear to you the methods whereby diagnoses of syphilis and of eczematoid ringworm of the hands may be established; if I have convincingly brought to your attention the fact that cutaneous inflammatory affections of the hands in dentists are only occasionally occupational, and are much more often due to some nonoccupational factor; and finally, if I have succeeded in clearly explaining to you the methods by which a tentative etiologic diagnosis of an occupational dermatitis in a dentist may logically and scientifically be confirmed, the purpose of this paper will have been achieved.

A NEW PRECISION CASTING TECHNIC

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IN THE past, many casting technics have been presented to compensate for the shrinkage of gold. To justify its presentation, a new technic must have all the advantages of the older technics, and the disadvantages must be eliminated or greatly reduced.

The disadvantages of the different technics and the materials in use are known to every dentist. The ideal technic to me would seem to be one in which all the expansion of the mold could be obtained as a permanent setting expansion of the investment. The wax pattern is covered with investment, the expansion taking place while the investment is setting. The expansion must not be influenced by a ring of any kind. The amount of expansion must be in the hands of the operator. The expanded mold so made should be invested in a casting ring with an investment that has no setting change. There should be no investment change in the burning out of the wax pattern. The technic should be such that the operator is not required to buy new, expensive equipment. I feel that the technic here to be described has all these requirements to such a high degree that error is for all practical purposes eliminated.

In a "Manual of Dental Prosthetics" by George H. Wilson, in the chapter on plasters, is a table showing that certain plasters expand up to 0.044 inch to the inch by taking up moisture from the air. This moisture is utilized in supplying water of crystallization needed to complete the reaction taking place. This phenomenon is the basis of my technic, except that the water is supplied. This is also done in concrete work when newly laid concrete is covered with hay or straw and then sprinkled.

Numerous investments were mixed and placed between precision gage blocks, and after the initial set had taken place, the mix was immersed in water and the

results were noted. The following facts were obtained:

All casting investments that were tested expanded. These investments showed the following characteristics:

The thicker the mix, the greater the expansion.

A mix made with hot water expanded more than one made with cold water. The fact that the mix had cooled before it was placed between the blocks did not seem to affect the expansion.

The time at which the mix is placed in the water is of utmost importance. It was found that if the mix was placed in the water early, it would not expand so much as when placed in a little later. It was also found that if the mix was placed in the water after a certain time, it would not expand to the amount the mix was capable of expanding.

The temperature of the water in which the mix is placed is important.

The amount of mixing helps to determine the amount of expansion. One minute hand-spatulation was adopted, the air being well beaten out of the mix by pounding against a solid object.

The mix should remain in the water at least twenty minutes to get the full expansion.

When low heat is used for wax elimination, little or no change takes place in the investment. High heat produces further expansion in the high-heat expanding investments. Some investments showed no more than 0.2 per cent change when heated up to 1400 F. All of the investments showed shrinkage on cooling.

The same mix would give the same expansion every time, to within 0.1 per cent. The percentage change is given in linear measurement.

These experiments gave some very gratifying results. It was found in this manner that R & R green investment could be made to expand 2.2 per cent; Kerr precision, 1.5 per cent, and Kerr No. 1, R & R gray, and pyromold No. 2, from 1 to 1.2 per cent. A mix of equal parts of R & R green and Kerr No. 1 or equal parts of Kerr precision and Kerr No. 1 gave investments in which the expansion was not interfered with, and these investments could be heated to 1400 F. with no more than 0.1 per cent further expansion. The initial expansion was somewhat harder to control in these mixtures. By varying one or the other elements that enter into the change of expansion, any expansion up to 2.2 per cent could be obtained. The usable expansion could be obtained by many different mixes.

This brings up the question as to which is the proper mix to use for a given expansion. It was found that if a 1.6 per cent expansion was used with a thick mix, a casting similar to a full crown, a casting for a mesioclusodistal steel die and a casting for a measured one-quarter inch block would all fit accurately. When a thin mix was used that gave a 1.6 per cent expansion, none of the castings fit. These castings were made with an inlay gold. This last experiment would lead me to believe that the porosity of the mold helps greatly to determine the size of the casting.

At this time, I wish to bring up another point which is radically different from the accustomed procedure. Dentists use one technic for a simple inlay and another for a full crown. In foundry practice, the pattern maker allows one-eighth inch to the foot for shrinkage in cast iron regardless of the size and shape of the casting. Since we are duplicating the size of the wax pattern in gold, it would seem that if our technic is correct, the same method for the same

gold should afford an accurate casting regardless of its size or shape. The foregoing experiment substantiates this statement.

With these data, expansions were developed for the different kinds of golds, from thick mixes. For the average inlay gold, an expansion of from 1.5 to 1.6 per cent seems to be proper. When hard golds with lowered melting points and lowered spheroidal tendencies are used, 1.2 per cent may be enough.

This brings up the subject of shrinkage of golds. I shall not go into this other than to make a few general statements. Light-colored 22-carat gold shrinks very much, probably the most of all dental gold. Light gold, 22-carat, shrinks more than 24-carat gold. Dark 22-carat and many inlay golds give average shrinkage. Hard golds with lowered melting points and lowered spheroidal tendencies shrink the least.

From what has been said, it can be seen that we must have an expansion technic which can be adapted to the golds we are using. Here again, I cannot give a technic for every gold. I feel that if the proper expansion is not chosen the first time, the results will at least be so much better than the technic formerly employed that the operator will be pleased with the possibilities and try again.

Use of the following mixes is recommended to obtain the expansion needed. The mix for each material remains the same. The change in expansion is assured by the length of time the mix is allowed to set before it is immersed in the water. That time is figured from the time the water is poured into the investment.

The figures given will vary slightly with different cans of the same investment. The investment must be stirred well or there will be a variation in one can of investment. The water used will also cause variation in the expansion and the setting time. In some localities, the use of distilled water may be necessary.

The expansions obtained from R & R green investment (10 gm.) with 3 gm. room temperature water follow.

Mixing is done with a heavy hand spatula and the air beaten out of the mix by pounding against a solid object. Spatulation and pounding are repeated. This should take one minute.

The variation in expansion is obtained after the investment is applied to the wax pattern. After the initial set has taken place, the covered wax pattern is immersed in water at a temperature of 100 F. This causes the investment to expand. The amount of expansion is regulated by the length of time the covered wax pattern is allowed to set before immersion in water. The time is figured from the time the water is poured over the investment.

For expansions of 1.6 per cent, we immerse after ten minutes in water at 100 F.; 1.5 per cent, after eleven minutes; 1.4 per cent, after twelve minutes; 1.3 per cent, after fifteen minutes.

The investment should remain in the water at least twenty minutes and not more than thirty.

Expansions obtained from Kerr precision investment (10 gm.) and 3.4 gm. room temperature water, with the same technic as for R & R green investment, were as follows:

For 1.5 per cent, it is immersed after ten minutes in water at 102 F.; 1.4 per cent, after ten and one-half minutes; 1.3 per cent, after eleven minutes; 1.2 per cent, after eleven and one-half minutes.

The investments should remain in the

water at least twenty minutes and not more than thirty.

The technic for investing the wax pattern is as follows: From the percentages quoted, the desired expansion is selected. The investment and the water are weighed as indicated. The resultant mix will be quite stiff, and will be difficult to work on the pattern. To overcome this, a little investment is placed in a dappen dish, and a thin mix made. The latter is painted on the pattern with a sable brush and allowed to stand while the regular mix is made. The thin mix is now blown off the wax pattern, and the regular mix is easily applied to the pattern, either by vibration with a serrated instrument or by being worked into place with a stiff sable brush. The pattern is given a covering of investment one-eighth inch or more and allowed to set the required time, as indicated above.

After the covered pattern has set the required time, it is placed in a dish of water the temperature of which is 100 F. or 102 F., as shown above. The warm water in which the covered pattern is immersed not only causes the required expansion, but also slightly softens the wax pattern so that the fine margins in the investment are not marred. The investment is permitted to remain in the water at least twenty minutes and not more than thirty.

The covered pattern is now invested in any inlay ring with an investment that has little or no setting or thermal expansion. I find Kerr No. 1 satisfactory for the outer investment.

The burning out is done on an electric hotplate. I use a Universal, made by Landers, Frary & Clark. Shortly after the investment has quit smoking, it is ready to cast. If a hotplate of this type is used, an extra hour of burning out would not affect the case.

Casting is done with any good casting machine.

I am fully aware that some of the statements made in this paper are radically different from those at present accepted and in use. All measurements were made with such instruments as a Zeiss optimeter, precision gage blocks and standard micrometers. The weighing of the materials was done with an accurate metric balance.

SUMMARY

The permanent expansion obtained as a setting expansion is far superior to a thermal expansion.

The technic does not require special equipment.

Although the materials used were designed for another technic, precision results were obtained.

As new materials are developed for this casting technic, we will have an accuracy in small castings that could never be obtained by thermal expansion.

The technic is easily adapted for making expanded models for larger castings.

The ability to make certain investments expand by immersion in water opens up to the average dentist a new field in casting work, which, up to now, has been attempted only by a very few expert technicians.

THE PARTIAL DENTURE*

By HERBERT E. KING, D.D.S., F.A.C.D., Omaha, Nebr.

IN presenting a paper on the rather broad subject of "Partial Dentures," I hope that it will be possible to give a general review of the topic, and to select certain good points or bad of the various different methods of restoration of missing teeth. So often, the subject has been presented with the seeming purpose of advancing or explaining some particular method of technical procedure.

May we first define the subject, though in a true sense any restoration of missing teeth short of full dentures could be called a partial denture. Ira G. Nichols, in his recent book, "Prosthetic Dentistry," gives this definition: "Partial dentures are removable appliances for the restoration of part of the natural teeth and related tissues." The denture depends for its support on both teeth and mucosa and, seemingly by common consent, the field has been divided in recent years into removable bridges and partial dentures. Sometimes, the terms are used almost interchangeably, and we suspect that sometimes, because it has the better sound, the name removable bridge may be used to impress on the patient that he is not to have a plate or denture but something much more modern and up to date and, of course, more expensive, than the older appliance.

The use of the terms, then, has not become definitely fixed, but a generally accepted difference is that a removable bridge depends wholly, or at least for the major portion of its support, on the remaining natural teeth, while a partial denture depends for its major support on the mucosa or the soft tissues.

I shall not attempt to draw a definite line as to where the choice should be made between fixed and removable bridgework, for it is largely a matter of judgment and of individual choice on the part of the operator as to just where the one or the other may be deemed desirable. What we do wish to say is that, all too often, a decision is made from individual prejudice rather than from sound judgment.

We may allow ourselves to become 100 per cent operators, a very difficult ground to stand on. It is not well to say, "I would never make a fixed bridge," or "I do not believe in removable bridges." As an illustration, I have noted in a recent textbook[1] a cast shown having missing a single lateral incisor. Quoting the text, we find, "A difficult type of case to replace without extensive mutilation of the proximating teeth, as is frequently resorted to when a fixed bridge is applied." And yet, in the illustration of this case as completed as a removable bridge, there were inlays placed in the adjacent cuspid and central incisor and in a bicuspid and on the opposite side in

*Read before the Section on Partial Denture Prosthesis at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

1. Prothero, J. H.: Prosthetic Dentistry, Ed. 4.

a molar. Four inlays were used, as well as the necessary framework, including a palate bar to connect the attachments in these inlays and a further secondary rest on a second molar. All this to replace one single lateral incisor. I am asking if this is not carrying an idea to the point of an absurdity. Many restorations of a lateral incisor have been apparently successful when made with a veneer crown on the cuspid and possibly a rest on the central incisor. This, when cemented to place, is a restoration that is sanitary and can be forgotten by the patient.

We wonder which would be the method used if the missing lateral incisor were from the mouth of a dentist. Stanley D. Tylman, in a paper on "Crown and Bridge Prosthesis,"[2] says, "The profession as a whole has been misled by the removable enthusiasts in not distinguishing between proper cause and effect."

In my opinion, the average patient is more comfortable and is better served by means of fixed appliances, provided the teeth and tissues involved in their support can be kept in a healthy condition. This proviso, the "if" in this case, is of course highly important. Without due attention to this subject, the health of the investing tissues, it would be better in many cases to place no bridge at all.

We do not mean to imply that there is no place for the removable bridge but that with a sane and careful study of the case in hand and a well-balanced judgment on the part of the dentist, it will be found not always the most desirable method.

There are two schools of thought as to a technic for removable bridges. The one group employs clasps or external rests on the teeth used for support; the other, the so-called internal type of attachment. Naturally, there are good points on both sides of the question and also there are enthusiastic and sometimes rather prejudiced advocates for their particular method to the exclusion of the other.

It certainly does not seem reasonable to make the extensive preparation necessary for the average internal attachment in a tooth that has not already a filling or caries in the surface to be used. An unbroken enamel surface is a valuable asset for any tooth. It would be in my own mouth, I believe.

Where there are previous preparations or carious areas that may be utilized for inlays for the attachments, the internal type might be the most logical, and, when properly made, they are a beautiful and practical means of restoration.

As to the choice between the various patented or ready made attachments on the market for use in these cases: this must be left to the individual operator. There have been many of these appliances brought to our attention, some relatively very complicated in their mechanism. Simplicity and durability should be the guiding principle and, for the average operator at least, a highly specialized technic makes the use of some types very difficult. Exact parallelism and precision are very attractive in an ideal but rather difficult of attainment.

Simplicity always reduces the number of necessary adjustments in the future maintenance of an appliance. As one patient expressed a justified criticism of a case: "It is like an old type car: I don't dare get too far from a service station."

As to the removable bridge with attachments of the external or clasp type, what do we find to condemn or criticize? Much has been said and written as to caries occurring under clasps and there has undoubtedly been much damage resulting therefrom. When the cast clasp

2. Tylman, S. D.: Dent. Digest, 36:354 (June) 1930.

method was first called to the attention of the profession twelve or fifteen years ago, by Dr. Roach and others, it was so revolutionary and so easily applied that many over-enthusiastic followers apparently forgot any previous knowledge of the cause of caries. Large surfaces of the enamel were covered by the casting; the clasp itself was not even a smooth polished surface where it was in contact with the tooth, and the resultant decay was inevitable.

This, as we all know, brought on the reaction to be expected, and the cast clasp in the thinking of many men became discredited. This was not the fault of the cast clasp, but of the men who failed to give due thought to the principles involved. A cast clasp was too apt to be much too large, and not enough attention was paid to either proper design or finish. We believe that the careful operator can avoid most of the faults which are all too often seen in this connection. A cast clasp need not be much larger than the corresponding clasp made by any other method; the relative strength of a drawn or a cast metal of similar composition accounting for the difference.

The subject of clasp design is a topic in itself, but a few of the principles involved might be mentioned. It should be so planned that there is only the minimum amount of contact with the enamel that will give the required retention. Usually, the retention or grip on the tooth is due to that portion of the clasp at or near the ends of the clasp, and by placing these points in definite positions and relieving the remainder, we may avoid much of the danger of caries. The recent designs by Dr. Roach of the bar clasp are a successful attempt to follow out this principle. Where this design is indicated, it offers a very satisfactory solution of the question.

A second point in the design is a careful study of the thing the certain clasp is expected to do. A clasp should resist certain forces or hold a denture against dislodgment in a certain direction. Therefore, the clasp should be planned with this in mind instead of, as we so often see, being so made as to cover as much of the tooth as possible. Probably one-third or even one-tenth that area of contact on tooth structure would have been sufficient.

All this in regard to clasp design serves only to call attention to the many details and angles having to do with the proper diagnosis and design of whatever type of restoration we may wish to make for a particular case. Several attempts have been made to form a classification of cases for partial denture restorations and several such systems have been published. W. E. Cummer has done much good work along this line and more recently William M. Randall, in a chapter in Nichols' "Prosthetic Dentistry" has given a sane and reasonable classification, based upon anatomic conditions as to position and number of remaining natural teeth and upon the means of securing the necessary retention and balance on these teeth and their tissues.

A most important consideration is the classification of the case from a more important standpoint, that of the patient. We must study his general health, mental temperament and habits of prophylaxis, before looking at the mouth or the models to make a decision as to the mechanics of the case.

I wish to take the liberty to quote further from Dr. Randall[3]:

3. Nichols, I. G.: Prosthetic Dentistry, St. Louis: C. V. Mosby, 1930, p. 564.

Diagnosis literally means a comparison and study of the various symptoms gathered together in their mutual relationship to each other—biologic and physical—in such a manner as to enable the diagnostician to draw certain definite conclusions as to the best method of treatment or procedure in handling the case in the surgical, therapeutic and restorative measures—given separately or collectively.

The accurate and final diagnosis for partial denture cases is more complicated in many respects or at least presents a greater variety of problems in each individual case than in full denture service.

The conservation of the health and normal function of the remaining natural teeth and their supporting tissues is a more serious and, in many instances, a much more difficult obstacle than the designing and constructive procedure of the restoration. It is our sincere belief that there is no field of dental practice where it becomes more essential to more closely and accurately relate the biologic and physiologic factors to the physical or mechanical as in the choice of retainers and their relation to each other—the connectors and bases and the varied directions of the lines of stress of mastication through the artificial and natural teeth to the end that the coordinate result will both conserve the health of remaining natural teeth and the adjacent tissues and render efficiency in esthetics and mastication.[8]

THEORY AND APPLICATION OF THE McCOY "OPEN TUBE" ATTACHMENTS*

By B. G. deVRIES, D.D.S., Minneapolis, Minn.

IN any program devoted to orthodontia, the subject of appliances will always play an important part. It is true that frequently undue emphasis has been placed on the mechanical aspect of our profession, but, by and large, mechanics will always occupy a large place in our consideration of the subject. This is readily understandable, if we consider the status of the operator. He proves of value to the community only in direct proportion to his ability to solve the problems before him. In other words, his efficiency is measured only at the "operating point," the point of his contact with the public at large. This point finds him in the position of applying practically the means which shall put to the test the sum of his accumulated knowledge of the subject. It is here that the mechanical aspect steps firmly into the picture. Being the most tangible of all of the other contributing factors, is it any wonder that it receives a tremendous amount of attention? Being so tangible, there is little wonder that mechanical measures frequently receive more credit or more abuse, as the case may be, for successfully discharging their duty or miserably failing to do so. The difficulty has been that mechanics has usually been considered too empirically, too inflexibly, as a thing apart. It may seem incredible, but it is possible that orthodontic treatment at times has been more or less successfully consummated in spite of the appliances. We can conceive of conditions of this sort in which the array of "machinery" was far in excess of the demands for it; and, of course, the converse is also true.

I believe that empiricism in orthodontic appliances is rapidly giving way to a

*Read before the Section on Orthodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

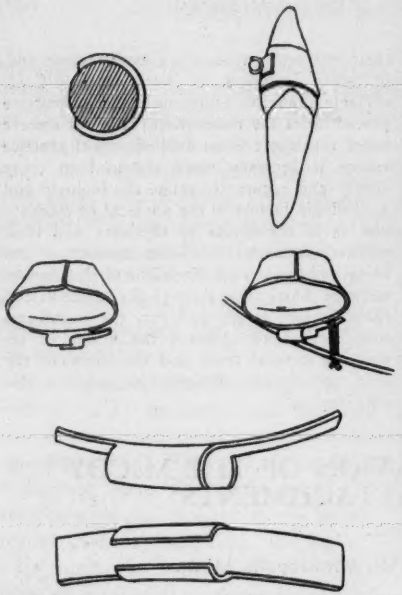

Fig. 1.—McCoy's "open tube" attachment, showing design; as soldered to bands; use in tooth rotation, and method of encircling arch wire.

Fig. 2.—Author's method of holding attachment for soldering: left, for free hand soldering; right, for fixed soldering. Tungsten wire ends are used for holding attachments.

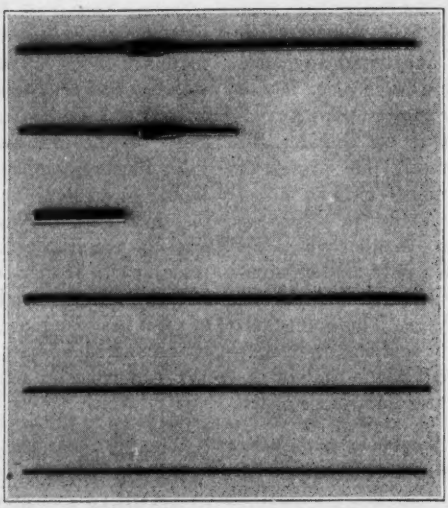

Fig. 3.—Labial alinement wire assembly. Reading from top to bottom: long end segment, 0.036 diameter; short end segment, 0.036 diameter; buccal tube, round or oval; 0.036 A. W. section; 0.030 A. W. section; 0.025 A. W. section.

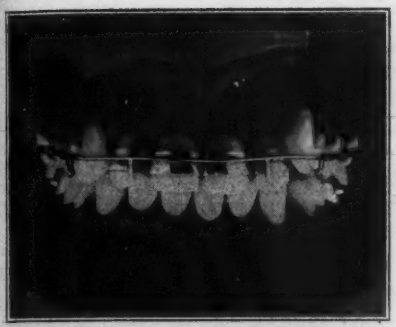

Fig. 4.—Superior incisor attachments to 0.030 alinement wire, showing extensions for apical movement.

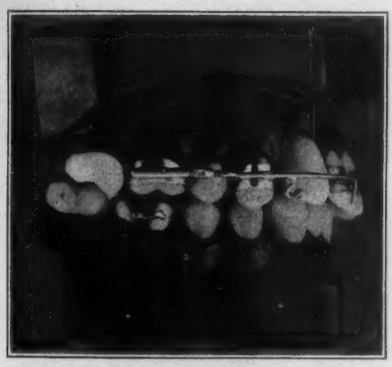

Fig. 5.—Lateral view of Figure 4.

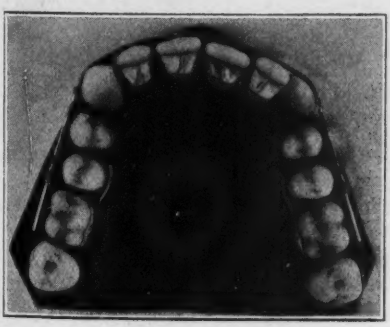

Fig. 6.—Palatal view of Figure 4.

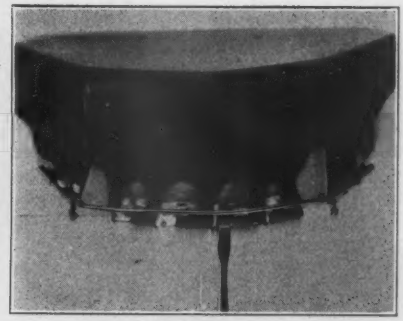

Fig. 7.—Author's method of releasing arch wire from attachments.

Fig. 8.—Cuspid attachments in conjunction with 0.036 alinement wire and intermaxillary force; extensions to central incisors.

Fig. 9.—Lateral view of Figure 8.

broader viewpoint of the mechanical problem. The younger men in our field have too great a background from which to advance to allow themselves to become altogether narrow in their enthusiasms and practices. They have the accumulated results of many years' experimentation and evolution to rely on, results which were garnered for them by the painstaking and sometimes costly experiences of others. I dare say there are within reach of my voice today men who could treat a given case of malocclusion equally well with any one of several different so-called systems of appliances. These are men who some time may have pinned their faith to a single star only to find the star developed into a comet. Other stars then claimed their attention, until ultimately they realized that much light comes from many stars.

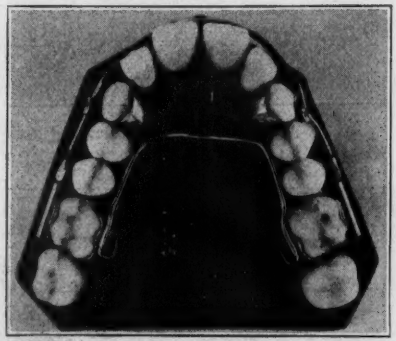

Fig. 10.—Palatal view of Figure 8; showing auxiliary overarch lingual wire and minimum number of bands.

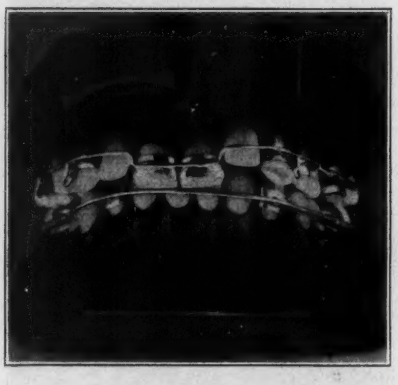

Fig. 11.—Attachments in conjunction with superior 0.036 buccal wire segment and 0.025 anterior wire segment; inferior 0.036 alinement wire. (Compare Fig. 14.)

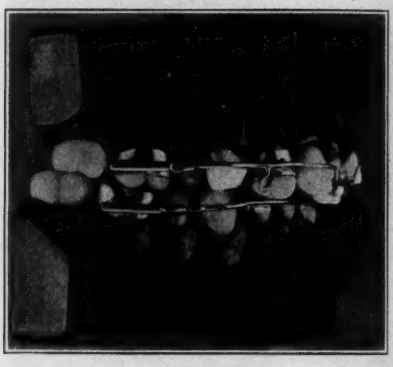

Fig. 12.—Lateral view of Figure 11.

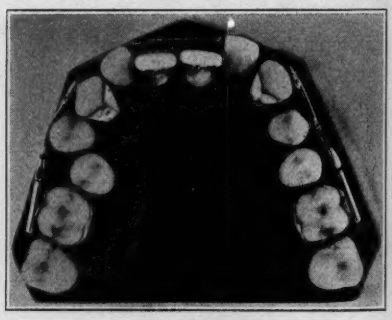

Fig. 13.—Palatal view of Figure 11.

It has always seemed wise to believe in the theory that we can always gather much good from many men. Every one of us is much broader and much more useful because of his contacts. Our in-

itial enthusiasm and our continued development are largely due to others, and whether we continue to grow depends on this very thing. Our personal attitude therefore should be to disseminate anything of value which we may believe that we possess in the hope that another may profit. Such an attitude should never be taken with an idea of converting another to our own point of view, but rather to help him develop a point of view of his own. The short exposition of the following technic is given purely in that spirit.

McCoy's "open tube" attachment is one which is credited with possessing a degree of latitude which should commend it to our attention. As we all know, attachments may be classed as rigid, semi-rigid or nonrigid. Frequently, in the same mouths, all three types of attachment might be indicated, and were but one type represented by the appliance, efficiency would be impaired. The usefulness of any attachment or appliance is in direct proportion to the nicety of its construction and application, and this

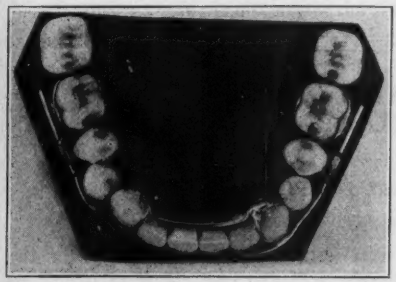

Fig. 14.—Lingual view of Figure 11; showing cuspid to cuspid segment and minimum number of bands.

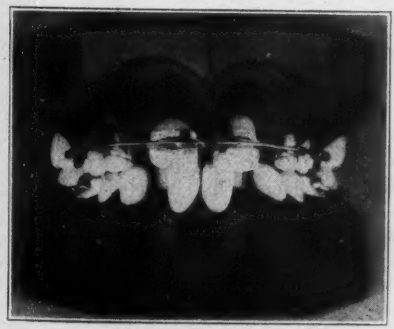

Fig. 15.—Attachments in conjunction with 0.025 alinement wire in mixed dentition; showing method of mesial movement of central incisors.

Fig. 16.—Lateral view of Figure 15.

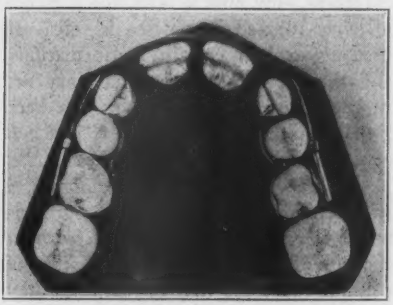

Fig. 17.—Palatal view of Figure 15; showing method of general expansion of maxillary arch.

holds true for the "open tube" attachment as well as for any other.

The "open tube" principle was employed many years ago, but in cruder form. My attention was first called to it by Dr. McCoy when it was necessary to make the attachment oneself by the use of a special pair of pliers. This product was crude and unsatisfactory as compared to the newer form as now manufactured. As constructed at present, the attachment presents a fine uniformity and is adaptable to a great variety of individual uses. Dr. McCoy, in a letter to me, once referred to these attachments as "little friends," and we have surely found them so.

The accompanying illustrations serve to present the design and technic of application of the "open tube" attachments.

INHERENT GROWTH AND ITS INFLUENCE ON MALOCCLUSION *

By CLINTON C. HOWARD, D.D.S., Atlanta, Ga.

IN some phases of the orthodontic specialty, we are more and more demanding that statistical investigation give us proof of certain claims. I refer especially to the assumption that malformation of dental arches and jaws is induced by mechanical stimuli. Mouth breathing, low muscle tone, the presence of hypertrophied faucial tonsils, etc., are used to explain certain malformations, and the prevalent theory that they are the cause of these conditions has been generally accepted without sufficient evidence to substantiate the hypothesis.

On the other side of the question, I ask consideration of a possible hormone which is responsible for growth without the aid of functional or developmental stimuli. This too may appear hypothetical, I grant, but, in substantiation, I offer some observations based on the study of 500 cases. If it is logical to assume that abnormal function causes abnormal growth, my observations lead me to regard the statement that there may be abnormal function and at the same time normal growth is more than a mere paradox—growth and development not being synonymous but different terms.

Before presenting the observations of this study, it is necessary, even at the risk of stressing the obvious, to review the path orthodontia has traveled in its attempt to explain the causes and their influence on dental arch and jaw formation.

THE THREE CLASSICAL TYPES

Class I.—We are taught that failure of the arches to attain sufficient size to accommodate the permanent teeth in functional position in that very large group, Class I, is due to a deficiency in masticatory stresses. The mechanical cause has, in recent years, been magnified by a considerable discussion on the subject of "muscle training"; which does not

*The material used in the accompanying tables was obtained at the Good Samaritan (endocrine) Clinic, Atlanta, Ga.

*Read before the Section on Orthodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

alter the old hypothesis that mechanics is a controlling factor in arch growth.

Class II, Division 1.—In the second group (Class II, Division 1), each phase of the characteristic inharmony of growth in both jaws and arches is explained as being caused by mouth breathing. In the case of the open-mouth individual, we are told how perverted muscle pull affects the mandible in its forward growth and how the tongue, displaced to the lower arch, fails to influence a lateral growth in the upper arch. This and similar conclusions are all based upon the hypothesis that the perversion of growth in these cases is caused by mechanical conditions.

Class III.—In the third group (Class III), the excess forward growth of the mandible is explained by the presence of hypertrophied faucial tonsils. It is said that the child so affected soon learns to project the mandible, thus gaining comfort in the crowded throat; an act which results finally in the mal-locking of the upper and lower groups of teeth, and, from this time on, abnormal muscle pull and the other "forces of occlusion" continue to accentuate the deformity.

The mention of such phrases as thumb-sucking, lip, tongue and cheek habits, sleeping habits, low muscle tone, etc., simply offers further evidence of our dependence on mechanical conditions to explain growth manifestations in the arches and jaws. Other mechanical manifestations of growth processes could be given, but this is unnecessary, since recorded literature is ample witness.

DISSENTING OPINION

I am well aware of the opposition usually offered an exponent of radically different conceptions of an old principle. A sudden emancipation from long-standing ideals rarely occurs. A generation or more is usually required. But in scientific progress generations are short.

Our present status in the realm of growth concepts is chiefly the fault of our tendency to accept teachings which have no background of scientific proof. Often, a man of reputation offers a seemingly logical solution of a biologic manifestation and, even though convincing evidence is totally lacking, his theories are accepted. For example, examine the literature on "muscle training" and its influence on jaw and arch growth, and find, if you can, a single bit of evidence wherein this procedure has been proved to be of value. The cases which have been shown to prove the value of muscle training do not actually prove anything. We can produce replicas of the same types of cases which, although not treated by any agency, have, during a period of several years, unfolded to a state of beautiful occlusion. Replicas of the other types that have been treated with appliances in after years presented a beautiful expression of growth.

"Controls" for comparative study would aid greatly in proving or disproving the hypothesis of "muscle training," but even the evidence based on "controls" in our problem would not be final. The variability of accelerated and retarded growth periods would have to be evaluated in conjunction with the time of applying extraneous stimulation and, for the present at least, our acumen in this regard is immature.

The foregoing was cited not for the purpose of condemning the practice of muscle exercise nor to discourage its advocates, but only to suggest that their deductions fail completely to prove a scientific fact.

CLASS III CASES

We will now proceed to an analysis

of the anterior mandibular overgrowth, or Class III cases. As previously mentioned, this malformation is attributed to enlarged tonsils. I was convinced that such a theory was formulated by observations made in a purely orthodontic practice where the number of subjects examined was too few to prove its correctness. This fact, coupled with contradictory evidence arising in my own practice, urged me to seek a broader field to prove or disprove the tonsil theory. This "broader field" was the Good Samaritan Clinic, where eight departments of medicine are represented in each physical examination. For eight years, I have had the privilege of placing in the records of this clinic a survey of the growth of the jaws and arches. At present, there are 1,900 cases on file. I began to tabulate the several items in the accompanying tables, accepting only those records which showed, from the history or findings of the nose and throat department, that the patient had suffered from enlarged faucial tonsils. In this group of 500 tonsil cases, a number of patients showed a definite history of previous operation for adenoids and tonsils, a number were designated as definite mouth breathers and still another group presented deviated septums. In Tables 1 and 2, certain general information is tabulated.

TABLE 1.—GENERAL FINDINGS BASED ON FIVE HUNDRED CASES, ALL SHOWING TONSIL INVOLVEMENT

Number of males	218
Number of females	282
Average age of males, years	10.8
Average age of females, years	17.9
Number of males who previously had adenoid and tonsil operation	67
Number of females who had adenoid and tonsil operation	109
Average age (years) of males when adenoids and tonsils were removed	7.7
Average age (years) of females when adenoids and tonsils were removed	13.9
Number found to be definite mouth-breathers	159

In Table 3, our findings were not in accord with the general opinion held by the orthodontic specialty. The ratio of 500 tonsil cases to twenty-one Class III cases certainly offers little ground for the theory that tonsils are responsible for this type of malgrowth. In the twenty-one Class III cases, nine patients, or 42.8 per cent, were definite mouth breathers. In the twenty-one Class III cases, ten patients were Mongolian idiots. (The large number of Mongolian idiots is accounted for by the fact that the Good Samaritan Clinic is primarily an institution for endocrine research. It might be stated that the percentage of Class III cases runs very high among these unaccounted-for individuals.)

TABLE 2.—ORTHODONTIC FINDINGS BASED ON FIVE HUNDRED CASES ALL SHOWING TONSIL INVOLVEMENT

	M	F	Total
Class III (anterior relation lower jaw to upper)	11	10	21
Class I cases (growth problem not involved)	14	8	22
Class I cases (with a growth deficiency of dental arches)	34	54	88
Class II, Div. 1 (posterior relation of lower jaw to upper, narrow upper arch, protruding upper incisors)	11	11	22
Class II, Div. 2 (posterior relation of lower jaw to upper, normal width of arches, retrusion of upper incisors, deep overbite)	1	1	2
Total	71	84	155

Suppose we discard the ten cases in Mongolian idiots; this would leave 490 tonsillar cases showing the small number of eleven Class III types, or a percentage of 2.2. Further, in the eleven remaining Class III cases, two patients were definite

mouth breathers. These findings were so startling that I rechecked my tabulations, but no error was discovered.

CLASS II, DIVISION 1 CASES

In Table 4, the findings convincingly refute the cause of Class II, Division 1 types as being mouth breathing. The most striking evidence is that, of the 159 definite mouth breathers, only twenty-two, or 13.9 per cent, presented Class II, Division 1 cases. There were ninety-four, or 59.1 per cent, of this 159 who presented normal jaws, normal arches and normal occlusion. The remaining forty-three of the 159 were divided between

TABLE 3.—CLASS III CASES (LOWER JAW ANTERIOR TO UPPER JAW)

Total number found in 500 tonsil cases	21
Number of Mongolian idiots	10
Number of average individuals	9
Number of average individuals who were mouthbreathers	2
Number of Mongolian idiots who were mouthbreathers	7
Number of mouthbreathers presenting Class III cases	9
Percentage of mouthbreathers in the 21 Class III cases	42.08

Class I, local in origin; Class I, with a growth deficiency of the arches, and Class III. The percentage of these last three groups combined was 27.1. Class II, Division 1 cases appeared at the ratio of one to seven in the 159 positive mouth breathers.

Although twenty-two cases of Class II, Division 1 type are too small a number to offer for study, I was curious to know whether the physical records would show any constant markings which might be deemed a feature of this type of individual. This information is given in résumé below. It can be stated that nothing in the history or in the physical findings of this small group is peculiar to Class II, Division 1 malformation.

DEVIATED NASAL SEPTUMS

The conciseness of each survey recorded by the nose and throat department made it simple to tabulate the number of deviated septums. It is to be understood that, since practically no individual shows a perfectly straight septum, the recorded deviated septum cases are those in which function was interfered with. Table 5 gives information in accord with Cryer's work along this line. The evidence invites no comment except that it is conclusive in proving that growth of the nasal septum is independent of the growth of the upper arch.

TABLE 4.—MOUTH BREATHERS

Number of mouth breathers found in the 500 cases	159	
Number of the 159 mouth breathers presenting normal jaws, arches and occlusion	94	59.1%
Number of the 159 presenting Class II, Division 1 cases	22	13.9%
Number of the 159 presenting Class III cases	9	5.7%
Number of the 159 presenting Class 1 (with both deficient arch width and normal arch width)	34	21.3%

RÉSUMÉ OF PHYSICAL RECORDS OF TWENTY-TWO CLASS II, DIVISION 1 CASES

Number of males, twelve; females, ten; average age of males, 9.5; of females, 16.1 years.

Chief complaint: This varied with practically every case.

Age when patient first walked, from 11 to 22 months.

Age when first tooth appeared, from 4 to 12 months.

Duration of breast feeding varied from none at all to twenty-four months.

Childhood diseases: Chickenpox, measles, whoopingcough, mumps, acidosis, rickets in addition to tuberculosis, pneumonia and smallpox.

Comparison of long bones and torso measurement: In two, equal measurements; in

fourteen, long bone measurements in excess of torso; in six, torso in excess of the long bone. (Physiologic age determines in great measure the relative length of the torso and long bones.)

Expression of medical examiner on general body growth: Ten slender and underweight; twelve, average for age.

Laboratory findings: Negative in all twenty-two cases, which included Wassermann, urinalysis, feces analysis and basic metabolic rate.

Growth progress of the hand and wrist bones: Normal in all cases except six—three retarded and three advanced.

Endocrine diagnosis: Made in thirteen of twenty-two cases: six hyperthyroid; 1, adolescent goiter, three hypogonads; one hyperanterior lobe (pituitary), one adenoma and one colloid goiter.

TABLE 5.—DEVIATED NASAL SEPTUMS*

Number of deviated septums found in the 500 cases. In males, 17; in females, 33; total	50
Number with normal arches and occlusion	36
Number with Class III or normal width of the upper arch	2
Number with Class II, Division 1 (narrow upper arch)	5
Number with Class I (narrow upper arch)	7
Percentage of deviated septums presenting normal upper arches	76.0

*The foregoing cases included only deviated septums which interfered with function.

COMMENTS ON GROWTH AND DEVELOPMENT

The words "growth" and "development" have been too loosely applied in orthodontic literature. Manifestations of growth are not synonymous with development. Muscles may achieve a state of development without any appreciable increase in bone growth. Therefore, development and growth should be separated in discussing the process of growth increase in bone.

Development is associated with function much more closely than with growth. Growth, in short, simply expresses an increase in the volume of a given tissue; while development is a commonplace descriptive term of differentiation and perfection of function. Thus, growth has a more specific meaning than development. Development offers two biologic manifestations: embryologic differentiation and physiologic function through use (perfection of function). For example, the fertilized ovum develops three primitive layers: the ectoderm, the mesoderm and the entoderm. These layers are responsible for certain groups of tissues which constitute the body. This phenomenon is differential development. Perfection of function, the other phase of biologic development, and which most concerns the orthodontist, conveys a meaning allied with action. Muscular contraction and relaxation in mastication is a developmental expression of "perfection of function." In short, "perfection of function," as a phase of development, is inseparable from action. Up to the present time, there is insufficient evidence to prove that muscular development is a prime factor in inducing bone growth. There is an abundance of evidence that mechanical stimuli will cause a change in lamellae arrangement.

Oppenheim's work on monkeys only showed a reorganization of structural elements. The orthodontists formulated a concept from these experiments which led to the creation of "the law of bone growth." We went so far as to state emphatically that "bone would grow if mechanically stimulated." Evidence presented today certainly points to the contrary.

The bones of a sprinter's legs do not increase in length or breadth even though his leg muscles are in a high state of development. There are light weights, welter weights and heavy weights in the pugilistic realm of sports, and the muscular development of each class may be equal or nearly so, but the growth of

their bones by volume is tremendously different. Inherent growth impulses, better stated as the hormones of growth, are intrinsic factors, little understood, yet most apparent in effect.

To cite examples of these two terms: It has been my privilege to observe individuals who have never masticated a morsel of food, but who present an excess growth of arches and jaws. Function in these people was nil and muscular development was nil; but growth progress of the bone was magnified. I have observed many youthful individuals who had not grown in stature for three, four or five years, but who, over a period of twelve months, grew from three to six inches. Muscular development played no part in this increase in bone volume.

The opportunity has been afforded me to attempt the cure of certain unusual Class II, Division 1 cases, as well as other unusual types of Class III. Employing the same agencies which had served so well in many similar cases, I failed miserably in these unusual growth problems. Elastic pull or mechanical stimuli is in certain cases of no avail in directing the avenue of growth, the hormones of growth being far more potent in effect. Such cases are seldom reported, representing that group known as "failures," and looked on as a blot on the escutcheon of orthodontic attainments. What a pity for progress! What a damper on scientific investigation! I am honest in stating that, to me, a failure is more interesting than a score of successes, because through failure I learn, whereas successes I accept as the probable.

SUGGESTIONS PROMPTED BY SURVEY FINDINGS

It seems clearly obvious that our concepts of growth have been inaccurate because of an insufficient amount of material on which to base a logical conclusion. Cause and effect in growth manifestations have been, with few exceptions, confined to local or extraneous influences. Authors of orthodontic textbooks show, in their works, a vision lacking a depth of biologic acumen commensurate with the present status of information.

We seem to lean toward methods of exactitude, having adopted the inductive method of approach. Yet medicine has partially failed for this reason. The response of one individual to a given agency is no criterion as to what may happen in similar cases. Even the response to a given treatment by one group of individuals may not be the response of a second group of individuals with the same malady. Since we cannot control inbreeding to throw definite light on inherited tendencies, nor employ controls in the human being for experimental purposes, there remains but one method of approach, statistical study.

Orthodontia is sufficiently well organized to adopt a plan which might advance its progress as a scientific endeavor. Such a plan should be, in fact must be, along lines of statistical observation, but such investigation should not be in a private orthodontic practice. The field should be much broader, since our first need is the negative side of our problem. The application of practical assistance in removing interference to Nature should come last.

My own offerings in orthodontic literature have been in the nature of articles strongly advocating the potency of the hormones of growth in contradistinction to the hypothesis that mechanical stimulation would actually grow bone. My attitude remains unaltered. There are periods of growth and periods of nongrowth. There is unquestionably a propitious period for the application of ap-

pliances in accord with growth cycles, and we should know through statistical investigation when the greatest increase of growth takes place in the different areas and in which direction these impulses are working. With such available data, orthodontia as a science would be tremendously elevated.

The present almost universal practice of applying apparatus to growth problems of the jaws when the patient applies for treatment represents the weakest philosophy of our specialty. The theory that bone will grow under the influence of mechanical stimulation and that bone growth can be initiated by mechanical pressure has no place in the proper conception of our work. This assumption was born of a hypothesis, accepted as a theory and applied as a fact. Just as long as this fallacy is taught, accepted and practiced, so long will scientific progress be retarded.

Mechanical stimuli are subservient to inherent growth impulses and their application should be simultaneous with periods of growth. We should know through statistical investigation the best physiologic age in which to assist Nature in the treatment of Class II, Division 1 cases; Class III cases, and growth cases of Class I. We should attain a knowledge to better clarify certain types of growth cases on which mechanical stimuli have little or no effect. In my own experience, I have observed patients who made little or no progress under mechanical therapy for one or more years, and then, for no apparent reason, satisfactory results were quickly attained. It is such examples that point so strongly to the theory that the hormones of growth are the predominant factors in bone changes.

This discussion is not addressed to those exponents of orthodontic therapy who use vicelike appliances on great numbers of teeth. Their modus operandi is incompatible with the laws of inherent growth and obviously they pin their faith entirely to the fallacy of synthetic growth.

The value of this presentation, it seems to me, will be its influence in stimulating a line of thought which will lead to the practice of making the use of mechanical appliances subservient to Nature's laws of growth.

CONCLUSIONS

1. The etiology of growth anomalies of the jaws and dental arches remains unexplained.

2. Muscular influences (mechanical stimuli) are not so potent as is now believed. If so, a total of 159 mouth breathers would show more than twenty-two cases with Class II, Division 1 deformity.

3. The open mouth is not a positive factor in producing Class II, Division 1 cases. If it were so, nine definite mouth breathers would not present Class III cases, the antithesis of Class II, Division 1.

4. The perversion of muscle action has failed as a factor in growth progress. In ninety-four cases of open mouth there were normal arches, jaws and occlusion.

5. Cryer many years ago refuted the theory that deflection of the septum was due to the presence of a narrow high arch. The findings here reported seem to corroborate Cryer's work.

DISCUSSION

W. A. Clarke, Atlanta, Ga.: There is no reason to believe that scientific orthodontia will not continue to advance as long as orthodontists holding to sound fundamental principles continue their researches and gather statistics outside their own practice, presenting evidence in refutation of our present concepts. Outside, we see the typical, the usual, and thus we gather new light on the unusual. Dr. Howard has made a fine distinction between growth and development. If we would only

think of development in its dictionary meaning, "to unfold—to pass from a lower to a higher stage," we would have a clearer understanding. Let us separate it from growth, which is only one of the many phases of development. Dr. Howard has stated that he does not believe malformation of dental arches and jaws is induced by mechanical stimuli, and, in substantiation of his belief has offered us his observation together with statistics on 500 cases to prove the fallacy that mechanical stimuli cause malgrowth. Surely statistics on 500 cases are worth more than statistics on no cases or a few cases. I gladly accept the compilation of statistics as accurate and unbiased, even though it jars my ego to find (in Table 4) ninety-four cases of normal jaws, arches and occlusion in 159 mouth breathers, or 59.1 per cent. In the 159 mouth breathers, more Class I cases than Class II, Division 1 cases were found. I was taught so long and read so much in support of the statement that mouth breathing was a predisposing cause of Class II, Division 1 cases that it is hard to forget these theories. What a godsend to dentistry and the advancement of orthodontia if we could get a textbook on orthodontia, to be used for undergraduate teaching, which would be a compilation with fifty contributors and a good editor, rather than to have to use one man's book.

George R. Moore, Ann Arbor, Mich.: In this contribution, Dr. Howard brings us another chapter in a volume of material which he began to collect as early as the year 1920. Each time he appears before us, we are more and more convinced of the fact that Dr. Howard's method of collecting data is truly scientific and that his data thus collected are complete enough to be capable of being repeatedly applied to the solution of new problems in our field as they come to the front. His method of approach should, in passing, be called to the attention of all who contemplate entering on research in the field of child development. Too often, our data are not linked up closely enough to those of other fields of physical investigation to be of maximum value in the end. It is far better to be over-zealous in making our data unmistakably complete than to find, in facing future problems, that we are short of material which could have been collected and was not. One of Dr. Howard's conclusions is to the effect that "the etiology of growth anomalies of the jaws and dental arches remains unexplained." He does, by the process of elimination, rule out many of the traditional and empiric beliefs as to the mechanical etiology of growth anomalies in the form of so-called forces of occlusion by demonstrating statistically either that percentages fell far too short to be conclusive or that there was a definite negative correlation. An example of this negative correlation will be found in Table 2, where it is shown that in 500 cases having had tonsil involvements, there were only twenty-one cases of mandibular overgrowth, while there were actually twenty-two cases of the same group exhibiting a directly opposite condition in the form of a posterior relation of mandibular arch to maxillary. In saying "directly opposite" here, I am looking at the condition from the standpoint of the exponent of mechanical influences as etiologic factors. In reality, I cannot see how the word "opposite" can distinguish the two types of deformity. By the presentation of such papers as Dr. Howard's and many others, these conditions are being relegated rapidly to the position of inherent growth anomalies, much more, in the last analysis, than has been commonly believed in the past. At the time of my entrance into our specialty a few years ago, I was so impressed with the advances in the biologic sciences then being made (which now continue unabated, as we all know) that, in my enthusiasm at that time, I would not have believed that, more than ten years later, one would find many in our specialty still tenaciously clinging to antiquated ideas, having as their foundation strictly local mechanical conditions. Why is it that we must always have something concrete and positive to supplant an old idea before it occurs to us that it can be dropped? Is not no explanation at all better than one in error? Will we ever progress until we recognize the force of Dr. Howard's statement, "The field should be much broader, since our first need is the negative side of our problem. The application of practical assistance in removing interference to Nature should come last." For years, our leaders in biologic thought in the profession have been endeavoring to place appliances in their proper light, as a means to an end, not as the end itself, and until we are successful in our schools of orthodontia in making our first aim the creation of a point of view and our second the promulgation of technical ideas and ideals, we cannot advance as we should. Both aspects of training are necessary, but the one must come first. The second is a danger-

ous instrument alone. To Hatfield, Johnson, Hellman, Howard and others, the profession owes a debt of gratitude for their insistence on the policy of observation of a given case for a period of time previous to mechanical interference. This attitude, years ago, marked the beginning of a movement which, year by year, gained more and more momentum. It is characterized by an earnest endeavor to solve what may be termed the negative side of our problem first. This policy of observation of cases was intended as a means of more accurately diagnosing the condition at hand, while now, in addition to that valuable purpose, it has another advantage, in that, during observation, we are more likely to detect spurts in growth rate; at which times, Dr. Howard and many others believe, we may more rationally institute treatment, if treatment is indicated at all. I believe that Dr. Howard would be the last to deny the effect of mechanical forces in development. He is, I believe, anxious to put them in their rightful places as minor factors to be compared to the greater tides of inherent influence, as molehills might be compared to mountains. He would, I believe, accept the assertion that inherent forces predominate over growth to such an extent that the effects of local mechanical forces, such as muscle function and abnormal oral habits, affect the growing organism in degree rather than in direction. With the technic of investigation exhibited in Dr. Howard's paper, progress in diagnosis is certain to come with increasing rapidity.

Frank A. Delabarre, Boston, Mass.: From a purely academic point of view, it seems unnecessary to plead for a consideration of the influence of inherent growth on malocclusion, since the problem is essentially a biologic one, admitting that the individual capacity for growth is the major question involved, whether from the point of view of etiology, of prognosis or of treatment. It is encouraging that our specialty is putting such effort into the study of growth processes about which so little is known. Any organism starts life with its inherited quota of growth power. Whether it attains its full growth is determined by the balance of all its functions as aided or hindered by a multitude of environmental factors. Function is the expression of life, and the degree of functional efficiency and balance measures the abundance of life. Total absence of function is death. Impaired function upsets the balance and lowers the standards of health. Fatigue, worry, lack of exercise are examples of environmental factors that tend to inhibit growth. Habits that antagonize normal function invite distortions of growth. So, in the study of etiology, we must never expect to find a single cause nor to differentiate between the primary and secondary or even the contributing condition in most cases. To do so is to magnify the one and ignore or slight the others, with no attempt to strike the balance between all the good and bad forces involved in the problem. The results of all etiologic study so far have left us about where we started. Out of all the effort to fathom the causes of malocclusion, one condition stands out, in my mind, as a definite cause. When the full complement of teeth is not present (or if there are too many) during the period of growth and development, malocclusion is almost sure to result. The function of mastication is predominantly a mechanical one, which must conform to the laws of physics and mechanics as well as the biologic laws. It is more than that, because there are other functions besides mastication performed by the same units, such as speech and expression. It is logical to attribute influence to any condition that upsets the balance of functional activity of the mouth and nose and exerts its influence in a purely mechanical or physical way. Mouth breathing may be such a condition and so may many other habits. The application of etiologic findings, even if not positive, to operative procedure, calls for the effort to control or eliminate all suspected conditions. The treatment of malocclusion originally was entirely mechanical: it is largely so today; but it is gratifying to note the increasing effort to employ a larger measure of other aids to the establishment of normal functional activity, not only of the immediate region but also of the entire organism. Breathing exercises and muscle exercises are to be commended as an effort to restore functional balance. When science offers no proof or disproof, our only reliance is on logic and common sense.

Harry E. Kelsey, Baltimore, Md.: It is true that we have been too prone to accept evidence which is the result of superficial observation and to jump at conclusions, or form them on the evidence of only one or two cases. The data presented by Dr. Howard are most interesting, and of the kind that should, and if more were presented, would,

lead us to become suspicious of hypothetic etiology, or etiology based, as I said before, on mere superficial observation. The thing that astonishes me most and would seem to conflict with other statistics is the statement that ninety-four cases of normal occlusion were found in 159 cases of mouth breathing. I am not surprised that some cases of normal occlusion might be found among quite a large number of mouth breathers, because we know that normal occlusion has been observed in mouth breathers, but that ninety-four cases should present normal occlusion out of 159 examined, is very surprising, no matter what the class of patient. I should be just as much surprised to find that many cases of normal occlusion among any 159 persons that might be examined, whether they were mouth breathers or not. Of course, I assume that Dr. Howard does not refer to ideal alinement, but to an effective functional occlusion with normal anteroposterior relation of the two dental arches.

Dr. Howard: Dr. Kelsey's surprise should add to the value of the statistical findings. That these findings "would seem to conflict with other statistics," causes surprise on my part. Such statistics have completely escaped me. An "outdoor" clinic which is visited by people applying for physical, rather than orthodontic assistance will present a picture quite contrary to the one formulated in a private orthodontic practice. Again I plead for, as Drs. Clarke and Moore agree to, a broader knowledge of the negative side. Dr. Kelsey assumes that I do not refer to ideal alinement. Neither Dr. Kelsey nor myself has ever discovered such a missing link.

SYSTEMIC EFFECTS OF PYORRHEA AND TECHNIC FOR SURGICAL ERADICATION*

By HARRY M. McFARLAND, D.D.S., Kansas City, Mo.

THE word "pyorrhea" is the well-known abbreviation for pyorrhea alveolaris, suppurative periodontoclasia, periodontia or periodontal lesions and all types of gingival infections.

We are familiar with the fact that the surgical treatment of pyorrhea is not new. "In the year 1862 Robitzek of Vienna had treated cases of periodontoclasia by an excision of infected gum tissue followed by scraping of the exposed alveolar bone. In the year 1866, Riggs of Hartford, Conn., was the first dentist in America to treat periodontoclasia surgically.[1]

The operation of gingivectomy dates back from the time of Riggs.[2] Black[3] ascribes the operation to Riggs. Robert Neuman of Berlin, states that he has been practicing the surgical treatment of pyorrhea since 1912. He also claims that he was the first one to place this operation on a systematic and rational basis and no such work was presented to the profession before 1914. To Harold K. Box belongs the honor of presenting to the profession the most scientific and therefore the most creditable description of the initial stages of the morbid processes that usually lead to pyorrhea.

Of the more recent outstanding work in the surgical eradication of pyorrhea is

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

1. Zemsky, J. L.: Surgical Treatment of Periodontal Diseases with Author's Open View Operation for Cases of Dental Periclasia, Dent. Cosmos, 68:465 (May) 1926.

2. Berger, Adolph: Surgical Treatment of Periodontoclasia, J. A. D. A., 14:1013 (June) 1927.

3. Black, G. V.: Special Dental Pathology, p. 66.

that of A. W. Ward, of San Francisco, whose protective paste has been especially beneficial in the treatment of this disease, and of Frank Kaiser, of Los Angeles, who is entitled to credit for further developing the technic of Dr. Ward.

The term "pyorrhea" should be applied only to purulent periodontal infection in which pus is formed at the expense of the periodontal tissue, but it is

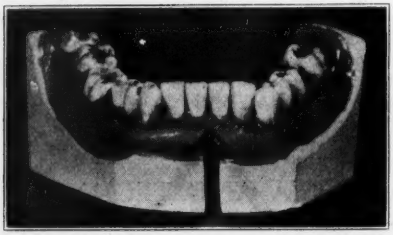

Fig. 1.—Application of spear shaped lance for removal of excess soft tissue on labial and buccal surfaces.

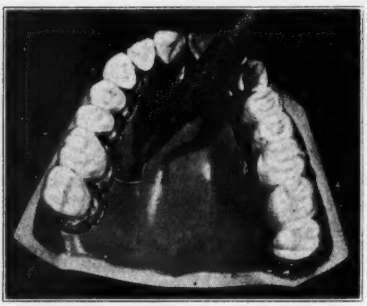

Fig. 2.—Angle knife (right and left) for elimination of diseased tissue around molars and bicuspids, lingual and buccal surfaces.

in practice applied to all periodontal diseases. As the etiologic factor, a wide variety of micro-organisms are considered, among which amebae, staphyloccocci, streptococci and the fusiform bacilli and spirilla of Vincent are most commonly mentioned. But there is no question that there are other at least predisposing factors in the disease, such as: 1. (*a*) Constitutional, i.e., age. (Pyorrhea occurs most frequently in people over 24, the age when the calcium metabolism changes.) (*b*) Disease, i.e., tuberculosis, syphilis and alcoholism. 2. Diet and nutrition. 3. Systemic poisons, i.e., mercury, copper, lead; chronic constipation, diabetes, nephritis and gout. 4. Local, i.e., malocclusion, impaction of

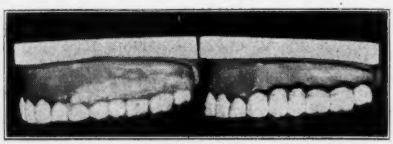

Fig. 3.—Models showing technic of tissue removal and protective paste in position.

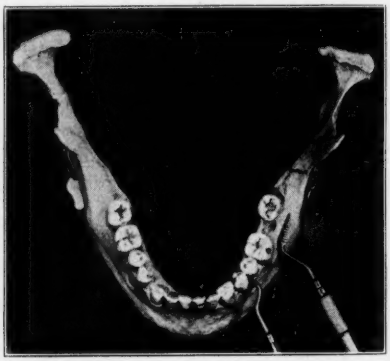

Fig. 4.—Proximal curet (push and pull cut) for removing edges of alveolar process, eliminating bone pockets and smoothing process.

food, calculi, occlusal stress, faulty crowns and bridges, overhanging fillings and irritants at the cervical margin of the teeth.

Two general types of pathologic processes may be distinguished; namely, those in the deep periodontal and alveolar structures and those in the gingival and

superficial attaching tissues. Changes in the periodontal structures consist in hyperemia with inflammatory exudation and hyperplasia of cellular elements of the periodontal membrane. The latter is increased in thickness. In the deeper structures are evidences of cell proliferation and bone resorption without inflammation. Bone resorption is brought on by (1) osteoclasis, which attacks the alveolar wall and forms lacunae without affecting the cementum; (2) halisteresis, in which bone is decalcified and changed to fibrous tissue and later dissolved, and (3) osteoporosis, or canalicular resorption. Of the three, the second is most common. Hyperplasia of the periodontal membrane consists in perivascular changes and proliferation of endothelial cells leading to the picture of arteritis obliterans. The perivascular changes consist in an accumulation of endothelial cells, lymphocytes, plasma cells and fibroblasts. These nodular formations later cause lacunar atrophy of bone. Changes in the gingival attaching tissue, which are very characteristic and essential for the diagnosis of pyorrhea, consist in the disintegration of the periodontal attachment by inflammatory disturbances. We have to distinguish between the purulent forms; i.e., true pyorrhea and in the more frequent apurulent form. In the purulent form, organisms invade the gingival crevices and erode the epithelial lining. Beneath the erosion, the tissue undergoes necrosis and liquefaction, and the process extends into the deeper structures. Granulation tissue with polymorphonuclear leukocytic infiltration is formed. In all the cases, abscess formation takes place, the abscess exactly resembling an area of periapical infection in structure. Purulent conditions usually are confined to the upper layers of the gingival tissue, contrary to other purulent infection of the gingiva, as in Vincent's disease.

In the apurulent form, the gingival changes are of low grade inflammatory character and are induced by mild forms of mechanical or infective irritants. They consist in accumulation of mononuclear cells and mast cells in the submucosa and cervical border and proliferation of the epithelial lining. The attaching periodontal fibers undergo slow degeneration, as a result of which their connections are severed. Later, the tooth becomes loose, becomes a foreign body, and after the extraction or exfoliation, the pyorrhea heals by fibroblastic proliferation and by formation of sclerotic connective tissue, which later may become sclerotic bone.

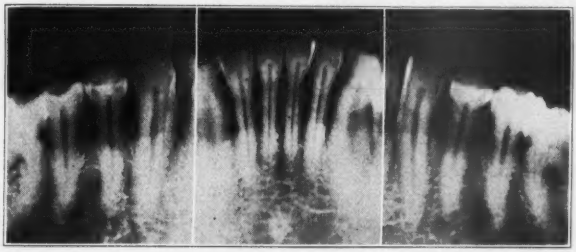

Fig. 5.—Appearance of lower anterior teeth preoperatively. The patient complained of rheumatism and severe pain in the back, at times causing total disability, and was compelled to remain in bed for two weeks at intervals. All teeth were vital. (Compare Fig. 6.)

It is generally conceded that oral sepsis

is one of the most common causes of systemic ills. The development of this knowledge marks a great advance in the diagnosis and treatment of disease. It is now apparent that many disorders which in previous years were considered obscure in origin and incurable are due wholly or in part to chronic infection, and that such diseases can often be cured or retarded in their progress by removal of the primary source of infection. It is also apparent that the occurrence of chronic sepsis is far more frequent than was formerly supposed. (Duke.)

It is noticeable that, in some cases, those with small areas of sepsis may show serious systemic ill-effects, while others with a greater amount may apparently suffer less. Some may be afflicted with one kind of systemic disturbance, while

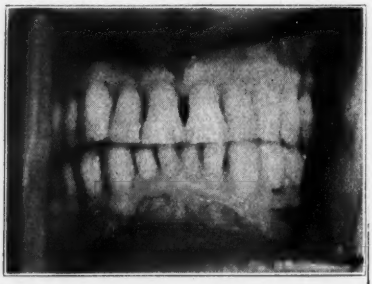

Fig. 6.—Appearance of teeth six months after operation. (Compare Fig. 5.) Gingivectomy was employed on the mandible and right and left maxillae. The flap operation technic was used on the upper anterior teeth. The patient made a complete recovery with no recurrence of symptoms.

others may have a similar amount of sepsis and have entirely different symptoms. In other words, one person may have arthritis as a result of infection in the mouth, while another with apparently the same infection may have nephritis.

Teeth without root-end infection, though diseased from pyorrhea, may be the source of serious systemic disturbance. Many times, patients have gone on year after year harboring an immense amount of infection without demonstrable symptoms, laboring under the delusion that they are well, and perhaps at the same time developing a leaky heart valve, nephritis or arthritis. As long as one's resistance is sufficiently good, and he may be able to carry on, he is impressed with the idea that he is physically normal. We very well know that many lives could be saved if disease could be discovered in its incipiency. We have a great responsibility, as it is our duty to use every means at our disposal in making the diagnosis. When these conditions are discovered, the information is most important to the patient, who should be told of the actual findings. He should be forewarned of advancing danger and should have the best advice that can be given him. If he will not take our advice, we have at least done our duty.

Those who are seriously concerned about the physical welfare of their patients are apparently impressed with the fact that our profession as a whole has not given the consideration to the eradication of pyorrhea that has been allotted to other important dental conditions. We have been laboring under the delusion in years past that infection from pyorrhea is not virulent. Practitioners of general dentistry are inclined to ignore such conditions, especially in the primary stages, and have paid more attention to root-end infection than to gingival infection.

Pyorrhea was first thought of as a disease affecting the soft tissue, but we now realize that the greatest damage to the supporting structure of the teeth occurs from the wasting away of the bone tissue. Definite procedures have been adopted for its eradication. Not only are we able to eliminate the disease and bring about a healthy condition in the mouth,

thereby, frequently restoring health and preventing other disease, but we are also enabled to save unlimited numbers of teeth removal of which we would have advised only a short time ago.

It has been definitely determined that disease conditions around the teeth and in the interproximal spaces frequently bring about remote organic disease. I have done research work in a clinical laboratory extending over a period of years and have paid special attention to checking mouths of patients suffering from systemic diseases, in cases in which the teeth were all vital. The outstanding information from our investigation is that short chain streptococci of a virulent type are commonly present.

"Further knowledge of the pathologic aspect of pyorrhea shows that it plays the same rôle in focal infection as does infection at the apices of teeth."[4]

It is not a theory, but a fact in pathologic anatomy that all pus sacks have a definite blood supply. I have lantern slides showing that these sacks have small blood and lymph capillaries which ramify throughout and by which infection may be taken into the blood and lymph stream and to all parts of the body. With this definite information and with these facts established, we cannot comprehend but we may have an idea of the enormous injury that may be done to countless thousands who need this service. It is best to operate in these cases before the condition is advanced, as there is less to do and postoperative treatments will be materially curtailed. Subgingival therapy as suggested by A. B. Vastine is recommended for preoperative treatment.

In most cases, it is preferable to use conduction anesthesia in operating as there is plenty of time to employ a thorough and careful technic. Some men can operate equally well under general anesthesia. When nerve block is effective, for the surgical eradication of pyorrhea, it is advisable to remove the teeth that must necessarily be lost in that zone at that time. We should know the physical findings regarding our patients, as often those applying for professional service are not in good health. Care should be exercised not to do too much surgical work at one time.

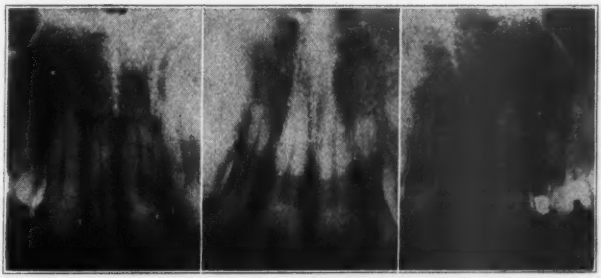

Fig. 7.—Preoperative appearance of case, showing absorption of process and results obtained. (Compare Fig. 8.)

General prophylaxis, correction of occlusion, proper diet, removal of irritation and polishing of teeth are to be desired, but when the roentgenograms reveal the breaking down of the alveolar crest or

4. Gardner, B. S.: Management of Infected Teeth in Practice of Group Medicine, J. A. D. A., 16:1013 (June) 1929.

when there is an excess of soft tissue around a tooth or teeth containing infected pockets, the most beneficial results can be accomplished by surgical removal of the pathologic tissue.

I use a pointed lance, spear shaped on all sides, inserting it in the interproximal soft tissue, resting against the cervical border of the alveolar process, and into the space as far as the teeth will permit. I then move the lance along the labial side resting against the teeth and the bone, from one interproximal space to another, eliminating all pockets of excess soft tissue. Interproximal curets are then used for the removal of all diseased tissue between the teeth and smoothing the process. Edges of the process are

Fig. 8.—Appearance of teeth four years after operation. (Compare Fig. 7.) The fibrous tissue was covered with normal epithelium. Gingivectomy was used in this case.

smoothed and bone pockets eliminated with the curet or chisel.

Several methods are used in the surgical eradication. Sometimes, it is best not to use the method as previously described. We find it advantageous in some cases not to cut away the tissue. In such cases, the gum tissue is retracted on both the labial and lingual sides and the curetting is then done as described before, after which the tissue is sutured to place by tying the suture through from one side to the other.

In other cases, we retract the tissue on the labial side as just described and remove it on the lingual side, as described in the technic of the first operation. When this is done, the sutures are placed in the tissue at two interproximal spaces and tied on the lingual side of the tooth without being attached to the tissue on that side. With this technic, sometimes the protective paste is used. In other cases, a mixture of 60 per cent beeswax and 40 per cent sticky wax is preferred by some operators. It is placed over the tissue and allowed to remain for several days. This affords an excellent result and when several methods have been used in the same mouth, it is difficult to differentiate between them after the tissues have healed.

After all the areas have been thoroughly cleansed and all pockets eliminated, a protective paste of liquid petrolatum, 4 parts, eugenol, 6 parts, zinc oxid and powdered rosin (yellow) is mixed to a thick consistency and applied with slight pressure from the labial side until a sufficient amount appears on the lingual. By such application, it is made to adhere, and it should remain in place for approximately ten days, after which it is removed and the new tissue is treated. The pack has a number of advantages in that it serves as a splint for the teeth, a desensitizer for the roots and a stimulus for the protection and regeneration of new tissue. It protects the operative area until new connective tissue fibers are formed to cover the cancellated portion of the alveolus, and prevents pain. The protective paste seems to promote the formation of healthy granulation tissue, suppressing, under the slight pressure, the overgrowth of capillary loops. This granulation tissue consists of newly formed capillaries, fibroblasts and exudative cells, changing later to a

firm, fibrous tissue, poor in cells and blood vessels, which attaches the soft tissue to the bone and is covered by normal epithelium. This seems to establish conditions which are as nearly normal as possible. Our experience is that this newly formed tissue has a high immunity against the recurrence of pathologic conditions.

After the pack is removed, we must consider a very exacting part of the procedure; namely, the postoperative care, which includes thorough prophylaxis, adjustment of occlusion and instruction in daily home care.

In the event the operator is specializing in oral surgery and is not carrying the case to completion in detail, he should refer the case to those cooperating with him in the surgical treatment of pyorrhea, to assume the latter responsibilities. By careful treatment, a firm, healthy tissue is formed around the teeth. We supply rubber toothbrushes or a toothbrush equipped with a rubber sponge to massage the tissue immediately after the pack is removed. This may be continued for ten days, after which time the regular toothbrush should be used. The methods of Charters in brushing and stimulating the tissues is recommended. Massaging and caring for the new tissue are of the greatest importance, and ideal results can be secured and maintained only by the cooperation of the patient.

Much credit should be given to those who are perfecting these surgical procedures as it has been definitely proved that such methods will bring about ideal conditions. If any one had told me, as I am attempting to tell you, of the results that can be obtained by these surgical procedures and the postoperative treatments, without the actual experience I would have been reluctant to believe the truth of these statements. The fact is that surgical treatment of pyorrhea means the removal of all diseased tissue, both hard and soft, about the teeth, and when this is done surgically in the proper manner, and the tissues are protected and treated until the regeneration of tissue takes place, a firm dense pink and fibrous tissue is formed. We have then eliminated the infection to the extent that absorption by the system ceases and we have stopped the wasting away of the supporting structures, thereby saving the teeth that otherwise would be lost. This having been accomplished, many patients who are ill will be restored to health, and many systemic complications will be avoided by this valuable service.

REPORT OF CASES

CASE 1.—A man, aged 59, suffering from an acute attack of neuritis in the right arm, could not rest or sleep on account of the severe pain. The tonsils had been removed. The physician had correlated every means for diagnosis except examination of the teeth. All teeth were vital to test. Radiodontic examination revealed general pyorrhea. Surgical eradication was performed, and the patient made an uneventful recovery. More than two and one-half years have elapsed without recurrence of symptoms.

CASE 2.—A woman, aged 57, suffering from an acute attack of neuritis in the right arm, had no pulpless teeth. Examination of the mouth revealed pyorrhea affecting all of the teeth. The upper right first molar was removed. Culture revealed virulent short chain streptococci. All other teeth were retained and the infection was eliminated by surgery. Two years and eight months have elapsed without recurrence of the original symptoms.

CASE 3.—A man, aged 55, was neurotic and suffered from loss of weight, general disability and an advanced general pyorrhea. The teeth were vital. The lower left cuspid moved. Culture revealed virulent short chain streptococci. All teeth were then removed. The patient made an uneventful recovery. Four years have elapsed and the patient is in apparently normal health.

SUMMARY

Cultures yield virulent short chain streptococci in some cases of pyorrhea and various kinds of infective organisms in different mouths. Patients with all teeth vital suffer from systemic disease as a result of this infection. Such conditions may be just as injurious as root end infections. Surgical technic for eradication of pyorrhea has been used a sufficient number of years to prove its worth. The technic described accomplishes definite results. Patients with various systemic symptoms make an uneventful recovery after surgical eradication of this disease.

DISCUSSION

Boyd S. Gardner, Rochester, Minn.: Several years ago, we thought it far more important to eliminate root end infection than infection found around teeth, but that belief has been completely changed, and it is now recognized as just as important to eliminate the so-called pyorrhea pocket as it is to remove a granuloma at the root end of a tooth. I do not know of anything quite so discouraging in the practice of dentistry as a generalized periodontoclasia, but with only two or three teeth sufficiently involved to advise extraction. As exodontists, we must admit we will have accomplished little, if anything, by extraction of the two or three teeth if something is not done to eliminate the remaining infection. If all the surgical work could be done at one operation with one anesthetic, the patient would be better served. The use of Ward's surgical cement can no doubt be likened to the use of the denture immediately after extraction, as healing takes place much better and more quickly when there is the desired resistance. We all appreciate that in performing the operation to which Dr. McFarland has referred, a new line of defense is established, but if the various general and local causes of this disease are not corrected, in a few months or years this same operation may have to be repeated and thus another line be established.

Menifee R. Howard, Denver, Colo.: The eradication of pyorrhea by surgical operation has its place in many cases and when properly used represents a most efficient and thorough procedure, eliminating focal infection, which in many cases causes systemic disease. Many years ago, pyorrhea was looked on as secondary in its systemic effect to the presence of the pulpless tooth. Now many consider it equal in its effect and, in many cases, as causing a greater systemic reaction. It is advisable in cases of systemic complications to be thorough in the elimination of focal infection and to give attention to the removal of infection having a pyorrheic source. A check up of cases with an ophthalmologist has brought the information that, in many cases treated by instrumentation, definite elimination of dental infection was not obtained. On the other hand, the same specialist has definitely proved by tests that dental focal infection was eliminated by surgical eradication. There are various operations for the eradication of pyorrhea. Dr. McFarland has given us the types of technic that are modifications of the more radical procedures. He has suggested methods suitable to various cases and most gratifying to the patient and operator. With this type of operation, it is possible to eradicate pyorrhea in cases that undoubtedly could not be handled by any other method, except the removal of teeth. Many have used the surgical technic for the eradication of pyorrhea for many years and have proved its worth. It is the most effective means for the eradication of abnormal pockets of both the hard and the soft tissues around the teeth. I desire to emphasize what has been stated in regard to the results obtained after the diseased tissues are eliminated and when careful postoperative care is exercised by the home care of the patient: the new tissue formed seems apparently to have a high immunity against recurrence of pathologic processes.

REDUCTION OF THE GINGIVAL FLORA PRECEDING OPERATION*

By HAROLD W. KROGH, D.D.S., Washington, D. C.

WHAT do you do when the proverbial "banker's wife" is sent you by the leading physician in town? She is suffering from a systemic disease thought to be focal in origin and has many suspicious teeth. You are to be responsible for the elimination of infection from the dental area. Surely, you are anxious that she have little disturbance following the removal of the teeth and that her general symptoms improve. What procedures will you institute so that the case can be carried through to a conclusion satisfactory to the patient, the physician and yourself?

Complete roentgenologic study, in addition to other diagnostic aids, as well as the physical findings given by the physician will determine the extent of the surgical work to be undertaken. All of the factors entering into the choice of anesthetic can be evaluated and the anesthetic decided on. Ordinarily, we are now ready to begin the eradication of the revealed infection.

The purpose of my paper is to describe an additional step in a careful and painstaking technic. All patients may not be "bankers' wives," but are they all not deserving of the same careful treatment? The additional step is the reduction of the gingival flora preceding operation.

For some years, A. B. Vastine and Robert A. Keilty have been speaking and writing concerning the importance of the gingival flora in relation to systemic disease and surgical procedure. It is the clinical application of their work, as regards surgery, of which I wish to speak rather than of any original work of my own.

This patient probably has the usual heavy gingival flora, and coincidentally with her other examinations, she is sent to the bacteriologic laboratory for what Dr. Keilty calls an elective bacteriostatic test. Material taken directly from the gingival crevice or pocket is implanted in culture tubes each of which contains a definite dilution of one of the various drugs used in practice. These tubes are incubated and the tube or tubes on which no growth appears are noted. The drug mixed with the mediums in the tube showing no growth becomes the specific for that particular case. Unfortunately, but few laboratories offer this service, and for that reason, general drugs adequate for the majority of cases will be given. At the same time, a fresh unstained smear in salt solution is examined to determine the kind, size and motility of the organisms composing the flora.

For purposes of treatment, the flora is divided into three groups: the protozoa, the spirilliform organisms, or borrelia, and a third group containing all the other types, and each group attacked separately. The protozoa I do not consider in preoperative treatment, but they

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

must sometimes be considered in the treatment of periclasia *per se*. Against the borrelia, a preparation of arsphenamin in glycerin is used. Against the remainder, or third group, the most effective drug is determined by laboratory test, as just described; or if there is no available laboratory offering this service, a high percentage of success will be obtained by using, either separately or in combination, a 1:1000 solution of metaphen, acriflavin or acriviolet in a 1 per cent aqueous solution. These three drugs have shown the highest degree of bacteriostasis over a period of two years, but they are by no means the only drugs of value, and in a given case may even be worthless. One of the cardinal points in drug efficiency is that the drug must come in contact with the bacteria to be destroyed. Much of the failure in the treatment of mouth infection is due to the inability of the drug to make contact. The smearing of medicines over the gingiva by means of cotton swabs is of no value in treating gingivitis. Medication is therefore applied with a Vastine applicator, which is a porte polisher containing an attachment for holding a Young's B. S. rubber cup. The cup is filled with the drug, carried to the gingival margin, placed firmly on the tooth, and given a pumping motion, forcing the drug under the gum margin to the depth of the pocket.

To return to our hypothetical patient: We begin treatment by giving instruction in the use of the toothbrush, employing castile soap or the soapiest toothpaste obtainable as a dentifrice. I have used soap as a dentifrice for some time because of its cleansing properties and bactericidal action. John E. Walker has recently shown that soaps are strongly bactericidal against all types of organisms except the staphylococcus and the typhoid bacillus. The next step is to remove any large calcareous deposits which would interfere with medication. At this point, we begin putting into effect some of the suggestions of Vastine and Keilty. The drug of choice to be used against the miscellaneous types, or third group, is now applied with the applicator to the entire mouth, an extra pumping being given where the pockets are deep or difficult of access. Since nearly all mouths contain borrelia, the process is repeated with the arsphenamin in glycerin preparation. Regardless of the combination of drugs used, the arsphenamin must always be applied last, as the glycerin would prevent absorption of subsequent drugs. We do not use cotton rolls or in any way attempt to confine the medication to the teeth and gums. If dyes are used, we grease the lips with cold cream, which, after the treatment, we remove with "kleenex." The patient should refrain from rinsing the mouth or putting anything into it for a period of at least one hour after the treatment. Daily treatments are given until the number of bacteria are satisfactorily reduced, which, in the average case, takes five or six days. Occasionally, in patients whose resistance is very low, or owing to the virulence of the bacteria or the difficulty of getting the medication in contact with the bacteria, as in mouths showing much poor dental work, the treatment time is lengthened. What is meant by "the number of bacteria are satisfactorily reduced"? This means reduction to the "irreducible minimum." The determination as to when the "irreducible minimum" is reached is a matter of experience, gained only by examining and treating many cases. The ideal case after treatment has only a small streptococcus residual. Thus far, this residual has resisted all medication, but it seems to have no clinical significance. Other

cases might show occasional organisms of several types. In case of doubt, more treatments should be given. The decision as to when the mouth is ready for operation can in most cases be based on clinical signs. The mouth will look clean, there will be no exudate from the gingival crevices, the gum margins will not bleed on pressure, the color of the tissues will be normal and the rubber cup will cry as it slides over the teeth. When the case looks clinically ready, the mouth should again be checked for flora. Extensive surgical work on poor risks should not be attempted until the dentist has had enough experience to be certain that the case is ready. When we are satisfied that the bacteria have been reduced to the desired minimum, the patient is ready for operation. From this point on, the advantages of this therapy will be increasingly evident.

There are two great advantages to be gained by this procedure: improvement in (1) the postoperative local effects and (2) the postoperative general effects. The advantages just given are intimately connected with the two main postoperative ill-effects, which I believe everyone would like to see eliminated from surgical practice. One is the failure of healing in the operative area; the other, the acute systemic exacerbations sometimes following even the most careful technic. The journals contain many articles concerning the bearing or influence on these two effects of local versus general anesthesia, of simple extraction versus surgical removal, of the chisel versus the bur, of elevators versus forceps, of hand pressure versus mallet force, and so on. All of these discussions are concerned with technic, the condition of the operative field being almost entirely forgotten. Men have thought that since the mouth could not be made sterile, progress lay in the improvement of surgical methods. Accordingly, during the last ten or fifteen years, the technic of dental surgery has gradually been improved until now it is on a plane equal to that of general surgery. That it may not always be so performed is not due to a lack of methods. I believe that our surgical technic has now progressed to such a point that we must look elsewhere for improvement in our results. The logical way to begin is to take stock of the field in which the surgical work is to be done.

Now and then, someone repeats the old statement that we work in the most highly infected field in surgery. This statement is usually made with a note of pride, and the work continues in the same old highly infected field.

Admittedly the mouth cannot be made or kept sterile, but is it necessary that it should be? Despite the most elaborate precautions, bacteria can be obtained from every general surgical operative site—even in "surgically clean cases," but only in small numbers. In order to invade living tissues, bacteria must be present in sufficient numbers to gain a foothold. So it is that, in dentistry, an effort should be made to work in a field containing but few bacteria. Owing to the nature of our field, the inhabitants must first be reduced to a minimum, and then just as much care must be exercised as in general surgery in order not to introduce any new organisms.

It is axiomatic that more surgical work can be done in a clean field than in a dirty one. Accordingly, the work is done in one operation, or, at most, two. Since the bacterial flora has been reduced to a point where the body can successfully cope with it, the clots will be organized and the wounds heal by first intention. Rarely will there be fever, swelling is reduced to a minimum and there is a

uniform lack of soreness. While swelling, soreness and other tissue reactions are to a considerable extent due to trauma, all things being equal the pretreated cases show far less reaction than the untreated. Of course, in an office practice, some attention must be paid to the appearance and comfort of the patient, but I'm thinking of sick patients in whom the removal of possible foci of infection is paramount.

How do we decide how many teeth should be taken out at one operation? This will depend in most part on where we went to school, in which part of the country we practice and a little on our thought and observation. Most medical men like the number "two," probably because it is more than one and less than three. Actually, there is little reason for the common cautious practice of interrupted removal of teeth; that is, the removal of but a few teeth at each operation. This practice spreads the surgical work over a long period and aggravates a most disagreeable experience in the life of the patient.

We talk a great deal about shock incident to the removal of teeth, and yet the shock we induce does not compare with that induced by the general surgeon. We have all had the experience of a patient's behaving beautifully the first time or two, coming without fear or apprehension, and, at the end of the series, coming in crying or in a highly nervous state. Many times, they will ask why the work could not all have been done at once, and we say they could not have stood the shock. Certainly, in these cases, the nervous and psychic shock produced can have no beneficial effect.

There seems to be no uniformity concerning the interval between operations; if the patient is badly "knocked out," it is sometimes necessary to wait a considerable length of time before she can be knocked out again. She takes these knockouts in the right spirit because she thinks they are essential to her cure. If the patient bears up well, the teeth may be removed at daily intervals or at times most convenient to all; and if the case is completed with no untoward or uncomfortable results, we modestly take the credit. Unfavorable results signify that the teeth were bady infected, and this caused her ailment.

Because these acute flare-ups are so common, most physicians advise their patients that they will probably get worse after the removal of their teeth, and then get better. I have seen patients worried and disappointed when the expected detrimental effect failed to appear. This expectation of the patient is most convenient to all concerned and covers a multitude of sins. The removal of infected teeth is supposed to loose a shower of bacteria into the blood stream, which causes the acute exacerbation but also vaccinates the patient against the periapical strain. As all the infected teeth in a given mouth harbor the same strain, the host is supposed to be protected by the defenses called out after the first inoculation incident to the removal of the tooth or teeth. This theory is responsible for the habit of removing one or two teeth and then waiting a week or ten days or any arbitrary interval until the patient is thought to have received the maximum effects from the vaccination; a theory which does not always work out in practice.

Rosenow, in answer to my question as to the significance of exacerbation following the removal of teeth said that, to him, it meant two things: it proved, first, a relationship between the focus and the systemic disease, and, secondly, that the surgical work was badly done. I believe

that he is right about the first, but wrong about the second. The answer to the second in my opinion should be that the oral surgeon works in a too highly infected field. Is it not a fact that most postoperative systemic exacerbations begin from twenty-four to forty-eight hours after operation; in other words, about the time necessary for the bacteria to break down the clot and invade the tissues in large numbers? After four years of applying this technic, I am convinced that the systemic disturbances are usually caused by the invasion in large numbers of the gingival flora and not by the stirring up of the periapical bacteria.

We all have the experience of doing a clever bit of surgical work in which everything goes right; and still, a day or two later, the clot breaks down. This happens often when we least desire it—with our friends or best patients. We know that if we had it to do over again, we could not do it better, and yet the result is bad. This is particularly true in the lower part of the mouth of patients whose sockets are surrounded by dense bone with the accompanying lack of blood supply. Such teeth are correspondingly difficult to remove, and the resultant trauma further inhibits the blood supply. In these cases, every effort must be made to preserve the life of the clot. On the other hand, we are all familiar with the patient whose bone cells are large, with no condensation around the sockets, and whose blood supply is so abundant that the wounds will heal almost in spite of anything we do.

There is always a battle after the removal of a tooth to see whether the body can organize the clot or the bacteria make a meal of it. If the body wins, we take the credit; if the bacteria win, we tell the patient that his delayed healing or painful socket is due to the badly infected condition of the extracted tooth, the worse the infection, the more the consequent suffering; which, of course, makes the patient most grateful to us for ridding him of such a terrible tooth. I have no quarrel with the man who tells his patient this, but to believe it and go on practicing in the light of that belief does not seem right. And then the sockets have to be kept open so that they will drain. It is a great game—this game of postoperative treatment. Some men get more money for the postoperative treatments than they do for the surgical work. But whatever our views regarding the cause of dry sockets, it must be admitted that the deciding factor is the loss of the clot, and therefore if the clot could be kept intact, there would be no dry sockets. I am of the opinion that clots are infected from the gingival flora rather than from the periapical strain. Certainly, the clot begins to break down from the surface. I have many times seen the clot only partially disintegrated, making it difficult to insert a sedative, and the next day entirely gone, and the socket smelling to high heaven. Sometimes, by prompt therapeusis directed at the bacteria, which are using the clot in the socket as medium in a culture tube, the disintegration can be stopped.

Are all of the cases which we see emergency cases? Yet the prevalent objection to preoperative treatment is the time involved. Many oral surgeons, because of the peculiar nature and ethics of their specialty, will prefer not, or be unable, to pretreat their cases. The majority of patients will need the services of the periodontist or restorative work of some kind. Although we may not be periodontists, we must certainly be interested in the health of all the oral tissues. So much has been proved against the gingival tissues as infectious factors in sys-

temic disease that our duty to the patient is not fulfilled by the removal of some teeth and the retention of others because of a difference in degree of bone involvement. In the treatment of periclasia, this therapy has a place, with the correction of occlusion, scaling of teeth, improved nutrition, etc. Whatever our feelings as to the cause of periclasia, there are almost always bacteria present in large numbers. And whether the bacteria are primary or secondary invaders, they are, at the very least, a load on the tissues. The removal of this load gives the tissues a chance to come back to normal. This tendency toward the normal in color and contour is one of the striking results of this treatment. Thus, it is seen that the adoption of this treatment adjunct by the periodontist will be of benefit to him and cause no loss of time to the patient. The case need not be carried through to completion, but only to the point where the bacteria have been satisfactorily reduced. The soft tissue improvement will also appeal to the man in general practice, who can include it in his practice without special training. The physician and surgeon will gladly wait an extra few days because the virtues of operating in a clean field are well known to and appreciated by them. We will be in difficulty in dealing with the referred work from the general man who cannot be convinced of its value, and will have to take orders as usual.

Patients frequently present themselves for removal of teeth with a complicating Vincent's infection. As everyone is familiar with the dangers of operating in a field showing an active Vincent's infection, these are obvious cases for pretreatment. If we think of Vincent's infection as caused by the same organisms as are ordinarily found in the mouth, it will make our treatment much simpler. Owing either to greatly increased virulence of the bacteria, or lowered resistance of the host, the bacteria become dissatisfied with a food débris diet and begin to eat the host. The important thing to remember in the treatment of this condition is that the baceria involved are born, grow up, live and die in fifteen or twenty minutes. We make use of this well-known fact by increasing the tempo of treatment. Instead of seeing the patient once a day, we see him two or three times daily in moderate cases, and as frequently as every hour in extreme cases. The only addition to the treatment as given is that of an oxidizing agent, hydrogen peroxid, which probably does as much good by the cleansing effect of its effervescing as by its liberation of oxygen, and an alkalinizing agent, sodium bicarbonate, for home use. A large percentage of cellulitis cases begin in the lower third molar area, a favorite home of chronic Vincent's infection. Of these, many are due to the removal of teeth while the soft tissues are acutely inflamed. This type of postoperative result can be eliminated if the area is treated in accordance with the ideas advanced here, until the inflammation has subsided, and then the teeth are removed.

During the past year, two papers by oral surgeons have made reference to preoperative treatment as described. One of them raises the point that it may cause a systemic exacerbation; and the other that it should be used if necessary. In my opinion, the danger of a preoperative exacerbation is nil. Regarding its necessity, I will say that it is as impossible to look into a mouth and determine what its bacterial flora are as it is to predetermine what a roentgenogram will reveal.

As much of my work is referred, I have an admirable opportunity for observing the effects of pretreatment. Obviously, as I can only pretreat those cases

over which I have control, it is necessary for me to operate in many cases as they present themselves. This is a compromise that I must make in the struggle for existence, but it has its value, as each group acts as a control for the other.

CONCLUSION

Permit me to restate the advantages which follow the reduction of gingival flora before operation:

1. There is an absence of local and general postoperative ill-effects, which will alone repay the dentist and patient for the time spent in pretreatment.
2. There is an improvement in the gingival tissues.
3. The bacterial factor in periclasia is reduced.
4. The procedure is applicable for use with any anesthetic.
5. There is less swelling and soreness, and the wounds do not break down.
6. The completion of the surgical work at one operation is possible.
7. It is much more pleasant to work in a clean field and easier to do surgical work. There is little incentive to do our best in a filthy mouth, but, if a mouth is clean, we have a different attitude toward the patient, and, unconsciously, do better work.

DISCUSSION

A. L. Frew, Dallas, Texas: Dr. Krogh has given us a good theoretical paper, but I doubt that the practical side of it is carried out except in a few extreme cases. It goes without saying that a clean mouth is always preferable in surgical work. As has been stated, because of the mixed bacteria found in the mouth, much difficult microscopic laboratory work is required, in order to isolate and group the bacteria. Dr. Krogh also states that bacteria are born, live and die all within the space of a few minutes. The mouth being a field that, after being cleared as nearly as possible of bacteria, cannot be kept clear, as it cannot be isolated, I therefore see no practical reason for carrying out the long detail of very difficult preparation for the removal of a tooth, or teeth. It was also stated that, after detailed preparation of a mouth, it is safe to do a full mouth extraction at one operation. I do not agree, since a person who has to have a complete extraction is one whose health is much below par, and is not a good physical risk. Too many teeth should not be removed at one time. Dr. Krogh mentions the fact that the surgeon, in performing a major operation, caused the patient much greater shock than we do in removing a full complement of teeth. That probably is true, but the surgeon keeps his patient in a supine position for from two to four weeks, and often longer. Were we to do that, I am afraid we all would lose our practices. It is true that a patient who has to have a full mouth extraction, and has only a few teeth removed at a time, gets nervous and dreads very much the last visits, but, even at that, it is, I believe, better than "knocking out" the patient surgically and forcing him to be in bed for some time. We will all agree, I believe, that it is poor judgment to operate in the oral cavity when there is any acute inflammation, especially if it is of the Vincent type, and it does not take a microscopic examination to determine this. In our cleft palate work, we have a large amount of denuded surface, and very seldom does infection develop. In these cases, there is no special preparation except to cleanse the oral cavity with alcohol immediately before the operation. Likewise, I believe that the thorough cleansing of the mouth with a good antiseptic solution, applying tincture of iodin very freely to the surrounding tissues and immediately after the extractions and thoroughly wiping the sockets out with tincture of iodin, will leave the tissues in a safe condition.

ECONOMICS AND THE DENTIST*

By FLOYD E. WALSH†, Omaha, Nebr.

IN these trying times, there is no topic which approaches in universal interest that of economics. It is the subject of discussion in international conferences, in meetings of boards of directors of great industrial and financial corporations, in political conferences, in meetings of professional groups, in family circles and on the street.

What is this thing called economics? It has been frequently defined as "the science which treats of those social phenomena that are due to the wealth-getting and wealth-using activities of man." It deals with all those facts about society which are based on the wants of man and his efforts toward satisfying them. In the early stages of man's history, his wants were few and the means of satisfying them comparatively simple. He was content, in fact, with using what he found. In subsequent stages of development, we find man beginning to make what he thought he needed, to save and to barter. Here, we have the beginnings of a constantly increasing complexity of social and economic order. With the invention of machines and the application of steam power came machine production, division of society into classes, as a consequence of division of labor, and a growing mutual dependence among individuals and groups for a livelihood. This present economic organization of ours developed rapidly and without any considerably controlled direction. Much like Topsy, it "just grew."

Economics may be broken into divisions according to the social unit which we have in mind. Thus, we speak of world economics, national economics, state economics, community economics, the economics of a given business or profession, family economics and personal economics.

Our interest in the field of economics is more than purely selfish, although the effect of economic forces in our activities as private individuals is our chief concern. We might assign three principal types of interest in this broadest of all social sciences.

First, we have, or should have, an interest which we might term an intellectual one. We are no Robinson Crusoes —we work and live in a civilization which rests upon a highly complex system of economic-social institutions and relationships. We read in the morning paper that England goes off the gold standard or that the Federal Reserve rediscount rate in New York has been raised 1 per cent. What do these things mean? Our offhand answer is likely to be, nothing to us. But wait. Is it not likely that England's action will seriously affect our international money markets and in turn our security markets, which *do* mean something to us? And isn't one possible result of a rise in the interest rate a drawing back into

*Read before Omaha District Dental Economics Club.

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circulation of hoarded money, which surely will affect the volume and cost of credit? Or, to come closer to our everyday and private activities, how many of us understand even the basic principles underlying commercial banking, building and loan association activities, insurance contracts, the methods of raising and expending public revenue? Yet we intrust our funds to the bank, enlist the aid of the building and loan association in establishing a home, rely largely on insurance companies for the financial protection of our families and of our earning power, and pay out a goodly portion of our gross income for taxes. The desire to know and understand the economic world in which we live is a perfectly natural one.

A second reason for our interest in economics might be described as a social one. We are concerned not only with what is but also with what ought to be. It is impossible to separate the science of economics from ethics and from the science of politics. To attempt to do so would be to make it truly the "dismal science." A great many of our efforts toward improvement of social conditions are governmental in character. In view of the fact that government is constantly assuming more economic functions, whether by control or by direct exercise, a citizenship informed on economic matters is essential if the government is to be efficient in this expanding field. In consequence, one of the most imperative duties of our generation is to insure for the young such opportunities as will both develop their higher nature and insure a fuller economic life. There is no gainsaying the fact that economic progress means the promotion of human welfare, and we cannot escape our responsibility in this endeavor.

Our third and most active interest is a purely personal one. This personal interest operates in two different directions, as regards, first, the economics of the business or profession in which we engage to earn a net income; and, secondly, general business economics, which in a very large measure determines the effectiveness of our spending and saving that net income.

For the facts relative to the broader aspects of the economics in a given business or profession, we must rely on the services of the research staffs of trade or professional associations. No private individual or concern has either the time or the facilities for accumulating these facts or the skill properly to associate and interpret them. Dentists have such organizations, and I take it for granted that they are contributing in every possible way to the success of their efforts. It is not enough, let it be remembered, that names be on a mailing list. An informed and assertive public opinion is just as essential here as it is in the field of government. But dentists do not intend to "let George do it." Evidence of the widespread interest in the broader economic aspects of dentistry was manifested by the organization, about two and a half years ago, of the American Dental Association Committee on the Study of Dental Practice, which is cooperating with the National Committee on the Costs of Medical Care, with economists, physicians, dentists, public health officials and laymen as members.

In the more detailed management problems of an individual dental practice, a few leaves can be taken from a business management handbook, for the basic economic problems are very similar. These are:

1. Location. Since the "product" of the dental office cannot be mailed or shipped, it is imperative that the dentist

be located close to his market; or, stating this fact conversely, that patients have ready access to his office. This is all the more true because the dentist, unlike the average business man, may not advertise his prices. The question of the advisability of location close to others in the same profession, and close to those providing related or contributory services, is also important. No less important is the seemingly trivial problem of automobile parking. Of course, the well-established specialist need not concern himself with these problems; but they may be of considerable importance to the young dentist just beginning his professional career.

2. Capital investment in plant and equipment. The danger here is in tying up capital in unnecessary equipment, which may possibly result in a large debt encumbrance, and certainly in a need for greater office space, with higher rent, insurance and taxes.

3. Establishment of standards of quality of the finished product and means of insuring their maintenance. In a word, this means to the dentist deciding on the standard of quality of service which he should render in relation to what is necessary and what is commensurate with the fees charged by him and his competitors. Since the dentist's professional reputation is almost wholly dependent on the quality of his work, he should make every effort to keep it uniformly up to standard.

4. Standards and specifications of raw materials used. The first step in solving the purchasing problem is to determine exactly what is needed and the quality or grade most satisfactory for use.

5. Determining the most economical methods of purchasing materials and supplies. After the facts relative to the supplies necessary and the desired quality or grade have been established, there is still to be considered the various sources of supplies, the unit costs in the light of quantities purchased, the credit terms and discounts offered, and the promptness and reliability of the service. Unless the business policies of dental supply houses differ widely from those of purveyors of industrial materials and supplies, the maintenance of adequate working capital and a high credit rating is essential in insuring economical purchasing.

6. Storing and handling raw materials and supplies. This is undoubtedly not a major problem to the dentist, although methods of insuring convenience and of guarding against deterioration and waste may warrant some attention. A place for everything and everything in its place is a time-honored maxim.

7. Technologic methods of fabrication in the production of the finished product. This is a far too specialized subject for a layman to attempt to discuss in its applications to dentistry. That it is important is evidenced by the space devoted to it in professional journals and the popularity of dental clinic programs.

8. Costs. The purposes and methods of cost analysis which may be applied to a dental office are similar to those which are encountered in a business enterprise. The measurement of the costs of products or services accomplishes two purposes: it controls the future expenditures for similar products or services, and compares the costs of the services with the income that they produce. Whether it is possible or desirable that the cost of each service be exceeded by the income produced is a matter of policy. At least, we ought to know what the various services cost and realize the necessity for balancing the business budget.

For a practical approach to the problem of costs, some kind of classification

must be worked out. In the case of a dental practice, the following grouping, in terms of their relationship to volume of service, might be useful.

(*a*) Fixed charges: interest, depreciation, insurance and taxes. These items of cost do not fluctuate materially in total amount regardless of the degree to which the equipment is used.

(*b*) Readiness-to-serve costs, such as rent, light, power, salaries of assistants, administrative and general overhead costs.

(*c*) Service costs, which vary with the number of patients served and the amount and kind of dental care that they receive. One of the most variable of all costs in this group is, of course, the time consumed in the various operations. If it is worth while for industrial concerns to conduct elaborate research in time studies, might it not prove to be of benefit to the dentist?

9. Establishment of selling prices. The economics of dental service changes is far too comprehensive and technical a subject for anyone but an experienced dentist. A great many economic changes have taken place which must be considered. From the practitioner's standpoint, we have: the increased amount of capital required for a properly equipped office and laboratory, the increased proportion of gross income (at least one-third) required to maintain his professional business, the development of specialism and of institutional practice. From the consumer's standpoint, it is a matter of common knowledge that a large portion of the population do not receive sufficient dental care. Some of this is due to lack of intelligence, much to lack of dentists and a great deal to lack of money. Great progress has been and is being made in educating the public in the value and importance of good dental service. The dental schools may be relied on, I suppose, ultimately to solve the problem of lack of dentists, if we assume, of course, that their graduates do not decide to congregate in certain communities. Probably the small amount that can be spent by most families for dental care in competition with the innumerable other demands on the family budget does more than anything else to limit the average dentist's earning power. Especially is this true in these times of reduced incomes.

I therefore believe that there are two reasons for a very active interest on the part of dentists in both our present and probable future general economic situation. The first reason is the very direct bearing of the amount of family income on the family dental budget. One dentist recently informed me that he did not need to consult any of the various business indexes to determine accurately the beginning of our present period of depression—he had only to consult his appointment book and his record of collections. And that point of time, incidentally, antedated by several months the stock market crash of October, 1929. In this connection, it is important to remember that it is *real* wages—nominal wages in relation to the purchasing power of the dollar—that is significant.

The second reason for an interest in the general economic situation concerns the spending and saving of the dentist's net income. Personal as well as business budgets must be balanced. Because of the radical changes in price levels, values have been materially altered. In some cases, these lowered prices mean unusual investment opportunities; in others, they represent prices which are still too high in comparison with intrinsic values. If spending and saving are to be wisely done, some comprehensive understanding of both the present and the future trends in business is highly essential.

ADVERTISING IN DENTISTRY

By HYMAN CAMINS*

A SMALL but valiant band of Greeks prepared to defend the pass of Thermopylae against the onslaught of a tremendous Persian horde. "There are so many Persians," a scout warned them, "that their arrows darken the sun."

"Very well," answered their leader, scornfully, "we shall fight in the shade!"

Today, there are so many unethical dentists that their signs darken the sun. They are being fought by a group of high-minded men who shall prevail in the end, because the superior order must always prevail in a critical test.

Ours is an age of intense commercial endeavor. Large scale production on a competitive basis has resulted in new trade methods, an example of which is the extensive advertising of our day. Unscrupulous individuals have carried these methods into professional fields, notably dentistry.

The sole function of dentistry is to render service to the community, a service essential to its welfare. If persuasion is required to make the community accept the service, that persuasion should come in the form of education, not of advertising.

The forms of advertising in dentistry are numerous and varied. Whatever the form, the obvious purpose is to attract attention and solicit patronage. It resorts to self-recommendation, by no means modest, and hardly so effective as the enthusiastic recommendations of satisfied patients. It must not be assumed that all advertising dentists are in every way unethical, that they perform every operation in an improper manner. Many such men actually do satisfactory dental work. On the other hand, there have been men whose ethics have consisted merely in a lack of advertising, whose work has not been up to the proper standards. Men of finer aspirations are sometimes trapped by circumstance into advertising practices. But that is all the more reason to regard advertising as an evil.

The chief objection to advertising is that it places dentistry in the light of a competitive commercial enterprise. Restorations are advertised as so many ordinary wares, the idea of the service and skill behind them becoming secondary, or actually lost. Unfair advantage is often sought. The ethical man will frankly reveal the impossibility of attaining success in many cases. The advertising man often creates the impression that he can offer a perfect solution to every problem presented.

The ultimate goal of dentistry is the eradication of dental diseases, especially caries. The greatest aid in achieving such an object will be preventive dentistry. This can be practiced only with the full cooperation of the laity, which will be forthcoming only if dentistry is regarded as a real, uncommercialized health service. There is a natural skepticism about

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the altruism of any service which is rendered for gain, and advertising will crystallize such an attitude into an absolute lack of faith. Such a loss of confidence would greatly impede the work of prevention.

It has been argued that no dentist would survive long if his survival were not justified. It has been claimed that the lack of merit is often compensated for by lowness of fees. In truth, dental work falling below the proper high standard is not permissible in any case, even though no fee whatsoever is taken. It is also true that dentists doing improper work have survived, and directly as a result of advertising. The latter is done by agents who are unfamiliar with the field, but are adept in imposing on the credulity of the general public. As the means of spreading publicity are today almost unlimited, and audiences are enormous, it is difficult to exhaust the supply of victims.

I have not used the term "advertising" in its very broad sense, except in the more definite one of regular organized publicity; for, in its wider scope it may include the highly ethical means of spreading one's good name by good works. A good reputation is built up very slowly and gradually, but once it is acquired, it becomes a bulwark capable of withstanding many shocks. It has been said that the world will beat a path through the forest to the door of the man who can make a better mouse-trap than can any other man.

The very means of publicity which are so often put to use in selfish exploitation may find a nobler use in the spreading of dental education. The lay press exerts a tremendous influence in the lives of the people, and the dental profession should take advantage of its benevolent power. Dental practitioners should contribute to the discussion of topics of interest to the dental welfare of the general public.

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A STUDY OF THE DECIDUOUS MOLARS*

By FRANK A. DELABARRE, A.B., D.D.S., M.D., Boston, Mass.

MY present conception of the growth and development of the dentition may be briefly generalized as follows: It is an orderly procedure, a continuous increase in size occurring in all three dimensions, with acceleration and retardation in the different directions, manifest in different zones at fairly well-defined physiologic periods, and a differentiation of the various units culminating in adult occlusion.

The acceleration for lateral growth is prior to, or coincident with, the eruption of the permanent incisors and cuspids, and there is no subsequent growth in this direction except in the permanent molar regions when the second and third molars continue to maintain the divergence of the buccal lines already established by the bicuspids and first permanent molars. The physiologic age would be approximately between 4 and 8 years.

The acceleration of anteroposterior growth occurs at the time of eruption of the permanent incisors and in successive periods prior to eruption of each permanent molar: i. e., 6, 9, 12, 18 years.

The acceleration of vertical growth is greatest during the exfoliation of the deciduous molars, when the rapid transition takes place from the mixed dentition to the adult, characterized by marked changes in all of the occlusal and functional relations of the dentition: i. e., from 10 to 13 years.

The successive stages in development are the deciduous, the mixed and the adult, the first two of which do not differ materially since the permanent teeth that appear in the mixed dentition are merely additions to the deciduous arch, temporary in position and in function.

The zone occupied by the deciduous molars, and their successors, the bicuspids, plays an important part in these changes, participating in the lateral and vertical acceleration periods, but showing, in the adult, a diminution in anteroposterior measurement, since the bicuspids in the maxilla are 1.5 mm. less in this measurement than the deciduous molars, and those in the mandible, 3.6 mm. less.

Nevertheless this zone, which shows no added anteroposterior growth after its first established measurement at the age of 2½ years, but, in reality, a shrinkage during the transition period, plays an important passive function as an anchorage resistance to insure the forward growth of the incisor region and also the posterior growth of the jaws for molar accommodation.

Although there may be an increase in the distance of this zone from the transverse auricular plane as the face itself grows forward, the zone itself moves forward as a unit, under the impulse of the growth in the molar zone.

Since the lateral growth acceleration is completed before the exfoliation of the

*Read before the Section on Orthodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

deciduous molars, it may be said that, as far as this dimension is concerned, the deciduous molars determine the width of the bicuspids.

The part played by the deciduous molars in the period of vertical acceleration is marked by a rapid elongation immediately preceding their exfoliation, which opens the bite appreciably and allows the permanent teeth to move into their very different adult relationships. It is at this time that the curve of Spee is developed.[1]

Study of the life history of the deciduous molars establishes the following commonly accepted points: Eruption of the deciduous dentition is completed at approximately the age of 2½ years. Root formation is not completed until the age of from 3½ to 4. Root absorption begins at about the seventh year and continues progressively until exfoliation, at about the tenth year. Therefore, the period of their greatest stability occurs within the period between the third and eighth year, increasing up to the fourth and decreasing after the eighth.

This period, then, corresponds very closely with the period of acceleration of lateral growth. Consequently, all the major phases and conditions indicate that this is the most logical time for stimulating lateral growth in the handicapped case. The deciduous molars must be used as points of application of force.

Lack of lateral growth is the most common attribute of malocclusion. Almost every case shows some degree of deficiency in this respect. Logical procedure in correction, as a rule, demands the establishment of harmonious and adequate arch width as a preliminary step to securing correct anteroposterior and vertical relationships. In other words, such width is a basic requirement.

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Editorials

WHAT YOU CAN DO TODAY

Much of the past is interesting, some of it is even glorious, and we are grateful for it, but it is all water that has gone over the dam.

The future is intriguing and inviting. It beckons us across the horizon to where mayhap we can catch a glimpse of the prospect beyond. We are always fascinated with the rainbow of promise, always looking for the gold at its end, always allured by the vision of what the future may hold for us.

And it is well that this is so, because it is only by virtue of the incentive thus gained that we go forward to better things.

Yet we must not forget that sometimes our vision turns out to be merely a mirage and what we fondly hoped was the substance is found to be only a shadow. Nothing is absolutely certain in the future, nothing wholly stable, nothing perfectly secure.

This does not mean that we should not prepare for the future—we should. But we are not always certain that our vision is accurate or that our plans will be perfectly consummated.

The lesson in all of this is that the thing that really counts is the present—it is what we can do today. And in all conscience there is enough today to claim our most earnest endeavors. Never before was there greater need for sane thinking and for accurate judgment. Some of the problems of the present loom up in menacing array, and we must meet them.

During the recent disarrangement of our economic structures, we were confronted with the fact that our thinking had not been accurate, and that our estimate of values had never been true. But shall we whimper because we have made a few mistakes and learned a lesson or two? Rather, shall we not face facts as we see them in the light of our manifest errors and right about face with the best grace possible, and the resolution to forget the foolish things that we were doing and try not to do them any more?

There is not a single individual of us who did not know better than to do some of the things that we were doing. For the moment, we were off our balance; and sometimes it looked as if we had lost our bearings completely. We say now: "If we only had it to do over again," but we must not forget the fact that we seldom have an opportunity to do it over again. The past is merely a record, it is not a program; and what we need today is a program. We need to face our present problems in the light of our present necessities. We cannot go on doing in the future precisely the things that we have always done and have them turn out advantageously. We cannot cling to the old methods and make them work.

Never again in the experience of the individual, or of the profession or the nation, shall we be confronted with the same set of circumstances that we faced in the recent past, and never again must our problems be met in precisely the same way. The order of the universe is growth, and we must keep step with it. The only things that are left to us and to which we may tie with assurance, the sheet anchor of our human experiences through the ages that have gone before, are the fundamentals of equity and justice that should govern our behavior as man to man in all the affairs of our lives whether material, mental or ethical.

And this problem is one for the present. It is not a reminiscent reverie of the past; nor does it wholly concern the future; essentially, it is what you can do today.

WHY NOT PUT IT IN PRACTICE?

If we study the literature of the profession, or if we listen to the reading of papers at our society meetings, we must be impressed with the activity of dental thought along various lines in our professional progress. Men are clamoring all the while to submit their ideas before the tribunal of dental thought. They are extremely anxious to lay their theories before the judgment seat of scientific truth, and they even apparently court the crucial test of final analysis in the alembic of time and experience.

All of this is most commendable. It is strictly in line with the better impulses of our professional idealism, and it connotes a healthy effort to advance the sum total of our scientific knowledge. True, the theories thus advanced do not always tally with subsequent established fact. Too often, the basis of reasoning is a foundation of shifting sand, and even the superstructure of thought is illogical and ill-advised. Nothing is altogether secure; nothing is final.

Even so, it is assuredly better that we aim at advancement and launch our thought even at the expense of occasional defeat and disappointment than that we smugly sit and slumber at the switch, content to let others do the thinking of the profession.

Out of all of it will come now and then a ray of light, a little here and a little there, and the profession is enriched thereby. Always and forever, the thought precedes the act, always our theories and our ideals are in advance of our accomplishments. And this is only reasonable and logical. We must think a thing before we do a thing; this is fundamental.

But the burden of our present contention is this: Why is it that so frequently we find the men who are apparently greatly impressed with the theories and ideas presented in our society meetings failing so utterly to carry out these theories in practice?

If a principle is acknowledged to be good and sound, why not give our patients the benefit of it by applying it to their needs?

This is not only true of our technical procedures, but, what is more important, it is doubly so with reference to our ethical conduct. This profession of ours has been continually grounded in the principles of correct professional conduct. From our student days, we have had inculcated in us the fundamentals of ethics and right living. No man may hide under the cloak of ignorance when it comes to the decision as to whether a given act is wrong. In every dental school in the land, no student is permitted to go out without a certain amount of training in ethics. In fact, it is usually drummed into him all along the line at every stage of his career, and, lacking this, a student is not well trained to practice his profession.

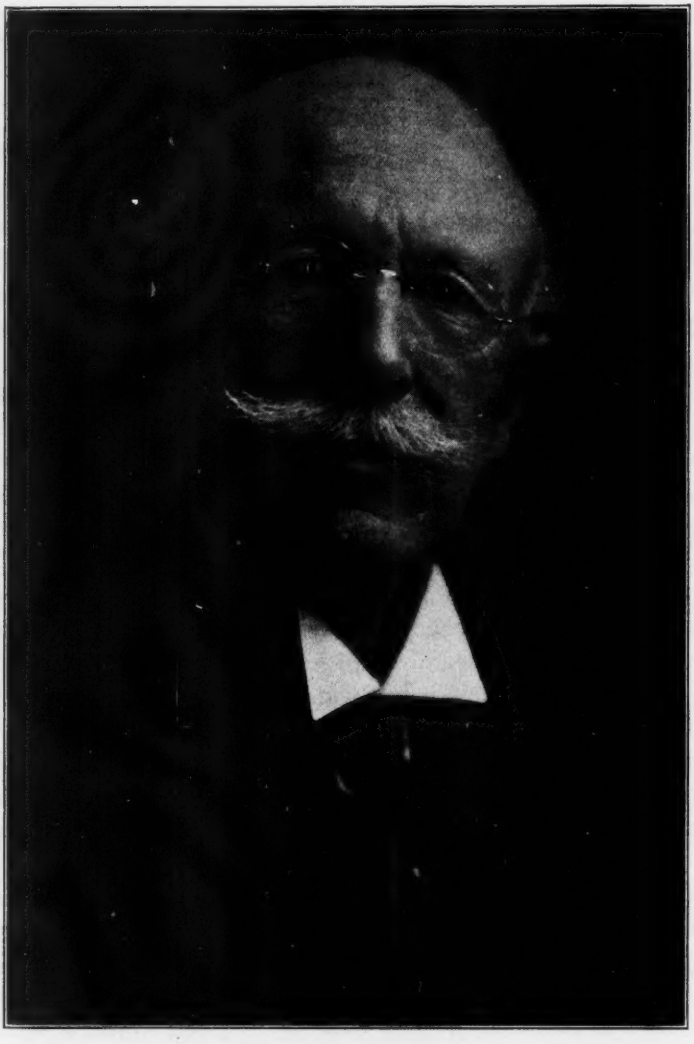
All of this being true, why is it that we frequently find practitioners who are so conspicuously lax in their ethical obligations? This relates not only to their treatment of patients but also to their treatment of their fellow practitioners. Real innate ethics should be part and parcel of every man's professional life, and, lacking this, the bone and sinew of our professional faith is null and void. We can forgive a practitioner who may be somewhat lacking in his technical skill, and who falls a trifle short in his scientific lore. Even with this handicap, he may be able to perform a creditable service to the people; but if he is wrong ethically, it is only a matter of time when his sins will find him out and he will be discredited and discountenanced.

The lesson is that no matter how much knowledge or skill we possess, and no matter how deeply we may be grounded in the principles of ethics, the whole fabric falls to the ground unless the knowledge and the ideals that we possess are put in practice.

JAMES LEON WILLIAMS, D.D.S.

(1852-1932)

James Leon Williams was born in Maine, April 21, 1852. He was there ushered into membership in a family already famous for its crusading spirit in the rights and advancement of man. Perhaps the first famous member of the family



JAMES LEON WILLIAMS, D.D.S.
(1852-1932)

was Oliver Cromwell, who was born a Williams. Roger Williams, who founded Providence Plantations; Capt. Samuel Williams, who fell at Lexington, and William Williams, a signer of the Declaration of Independence, were others. The little lad born on the Maine farm inherited a large measure of their spirit.

In 1871, at the age of 19, Leon Williams, as he was generally called, was launched into the practice of dentistry at North Vassalboro, Maine, under the tutorship of a dentist of high standing in the local profession, Dr. Roberts. Here, a year later, he married, and of this union four sons were born.

Shortly after his apprenticeship began, Dr. Williams joined the Maine Dental Society, of which, as he was only about 20 years old, he was probably the youngest member. Almost immediately, his bent toward progress became apparent. He borrowed the microscope which belonged to the society, kept it most of the time for two or three years, mastered a technic by studying advertisements and by correspondence and, working with home-made apparatus which would now be considered very crude, began those studies which were to do so much to set the histology and pathology of enamel on a secure foundation. In May, 1882, he contributed to the *Dental Cosmos* an article entitled "Studies in the Histo-Genesis of the Teeth and Contiguous Parts," which brought on an active battle with the supporters of the current ideas of histology. Later, Dr. Williams, but little known, met Dr. Garretson, then the leader for the old ideas and a most effective speaker, on the platform and successfully upheld the new theories.

His studies on the histology and pathology of enamel, which were continued for more than fifty years, provided a wealth of information. Many of the specimens which Dr. Williams prepared with his own hands and photographs of them which he made have never been excelled. In this field of science, Dr. Williams won world-wide fame.

Perhaps Dr. Williams is better known to many of the younger members of the dental profession because of his contribution to the advancement of prosthetic dentistry than for his work in histology and pathology. In 1887, Dr. Williams, seeking physical benefit, settled in London, England, where a threatening pulmonary trouble showed improvement. There he enjoyed practice with a distinguished clientele, in the course of which he made many prosthetic restorations. He early became dissatisfied with the esthetic qualities of the artificial teeth then available and, in 1905, he made a strong appeal to manufacturers for better teeth. Since the dental profession in general showed no interest in improved teeth, the manufacturers turned a deaf ear to his plea.

In 1907, Dr. Williams set himself to arouse the dentists of the world by a series of articles in the *Dental Items of Interest,* with strong editorial support by Dr. Ottolengui. As a result of the joint effort, 0.2 per cent of the dentists whom the magazine reached showed enough interest to write a letter approving the effort. After Williams and Ottolengui ceased their appeal, no one showed the slightest interest; but Dr. Williams, determined that his own vision and faith should become the vision and faith of his confrères, returned to America in June, 1910, and in July presented a powerful appeal before the National Dental Association.

As a result of the response which he was able to secure, he enlisted the support of a manufacturer in the carrying out of his plans. Funds and associates were provided and a campaign of unflagging effort was begun. In November, 1911, Dr. Williams made a discovery which, when put into practical form in 1914, separated all denture work performed before that time and without benefit of the discovery from all denture work done after that date and with benefit of the discovery. He

discovered that three typal forms of maxillary incisor teeth have been common to all races of men of whom we have even a reasonable record in the form of skulls containing anterior teeth, and that in living persons the effect is most pleasing when the form of teeth is like the outline form of the face, seen full front in repose. Dr. Williams gave his discovery practical value by producing artificial teeth in the typal forms and in blended forms. His principles and his tooth forms are now standard the world around.

Dr. Williams' mind was too active and versatile to be satisfied with studies in histology and prosthetic dentistry. He became an earnest student and an interesting lecturer and writer on the progress of man from his early beginnings down to the present. During one period of enforced idleness, he made himself so successful as a landscape artist that he might have been famous in that line if he had cared to follow it.

A few years ago, Dr. Williams purchased the farm on which he was born, and which was rich in memories of his parents and his boyhood. Here, he built a beautiful home and spent his summers. His winters were passed in New York.

While Dr. Williams had failed physically during the last four or five years, his mind had shown no signs of change, and his interest and awareness have always been greater than his strength. He died from heart failure, February 23. Mrs. Williams and two sons, Harry Williams and Percy Norman Williams, D.D.S., survive.

Dr. Williams was one of the race of giants who hewed out the foundation of dentistry as a profession. Differing often among themselves, battling violently with imperfect knowledge and for objectives not clearly seen, they nevertheless carried the whole profession forward with them. He did a work which will benefit many who never knew him, and he has left an imprint which will become deeper and deeper as dentistry becomes more and more a profession.

GEORGE WOOD CLAPP.

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The following articles have been accepted as conforming to the rules of the Council on Dental Therapeutics of the American Dental Association for inclusion in the list of Accepted Dental Remedies. The Council desires dentists to understand that the admission of an article does not imply recommendation. A copy of the rules which govern the Council in the consideration of articles will be sent on request.

SAMUEL M. GORDON, *Secretary.*

TRICHLOROETHYLENE.—Trichloroethylenum.—Trichlorethylene.—$CHCl:CHCl_2$.—1-chloro-2-dichloro-ethylene.

Actions and Uses.—The action of trichloroethylene has not been investigated comprehensively. It was introduced into therapeutics after some observations on man. Trichlorotheylene appears to have an action on the sensory endings of the trigeminal nerve, whereby it affords relief in trigeminal neuralgia, but it is not clear that the action even of therapeutic doses is limited to these endings. Different individuals seem to show rather wide variations in susceptibility to this action, and the dose necessary to afford relief varies correspondingly. Therapeutic doses sometimes cause transitory giddiness, with lassitude, distress, palpitation and nausea. Large doses cause narcosis, and excessive doses cause death. There was no perceptible injury to the lungs, heart or liver after narcosis repeated several times in the dog, but there was slight hyperemia of the gastric mucous membrane and marked reddening of the duodenum. The liquid is irritant; hence, it should not be allowed to come in contact with the nose when the vapor is inhaled.

Dosage: Fifteen minims by inhalation, to be repeated after a few minutes if necessary. It appears probable that not more than 60 minims should be inhaled within twenty-four hours when it is used for any considerable period of time.

Trichloroethylene occurs as a clear colorless mobile and volatile liquid possessing an odor similar to that of chloroform. It is miscible with ether and very soluble in alcohol. It is practically insoluble in water. The specific gravity is from 1.458 to 1.460 at 25 C. The refractive index is from 1.4770 to 1.4780 at 20 C.

Transfer 25 c.c. trichloroethylene to a distilling flask. Determine the distillation range according to Method 1 of U. S. Pharmacopeia X. Ninety-five per cent distils over at from 86 to 88 C. (corrected) at 760 mm. The refractive index of the distillate is the same as that of the material before distillation.

Transfer 5 c.c. of trichloroethylene to a glass stoppered cylinder, add 5 c.c. bromin water and shake the mixture vigorously at intervals of fifteen minutes; at the end of an hour, a white turbid solution forms in the lower layer. Agitate gently 5 c.c. of trichloroethylene with 2 c.c. of silver ammonium nitrate solution in a narrow glass stoppered cylinder of from 10 to 15 c.c. capacity. No turbidity is observed in either layer at the end of ten minutes (acetylene).

Agitate 20 c.c. of trichloroethylene with a 50 c.c. portion of water and repeat, using a 25 c.c. portion of water. Transfer the combined aqueous layer to a flask and add to the aqueous solution 2 drops of methyl red indicator solution. If the solution is yellow, the addition of not more than 0.1 c.c. of tenth normal hydrochloric acid is required to make it pink. If the solution is pink, the addition of not more than 0.1 c.c. of tenth normal sodium hydroxid will make it yellow.

Agitate 10 c.c. of trichloroethylene with 25 c.c. of water and allow the liquid to separate completely. Separate 10 c.c. portions of the aqueous layer are affected as follows: No turbidity is noted five minutes after the addition of 0.1 c.c. of nitric acid and 0.1 c.c. of silver nitrate solution (chlorids). No blue is observed after the addition of 0.1 c.c. of potassium iodid test solution and 0.1 c.c. of starch test solution (readily oxidizing substances such as free chlorin). Add 0.1 c.c. of alcohol to 5 c.c. of trichloroethylene. A turbid solution is formed (distinction from chloroform).

Evaporate 25 c.c. of trichloroethylene in a platinum or porcelain dish on a steam bath and dry to constant weight at 100 C. No weighable residue is obtained.

Trichlorethylene-Calco.—A brand of trichloro-ethylene.

Manufactured by Calco Chemical Co., Inc., Bound Brook, N. J. No U. S. patent or trademark.

Tubes Trichlorethylene-Calco, 1 c.c. Each trade package contains twenty-one frangible tubes.

Procaine Tablets No. 4 (Novol). Each contains procain hydrochlorid, 0.05 gm. (¾ grain). Each tablet dissolved in 2.5 c.c. (40 minims) of physiologic salt solution or Ringer's solution will yield an isotonic solution of procain hydrochlorid, 2 per cent.

Manufactured by the Novocol Chemical Company, Brooklyn, N. Y. No U. S. patent or trademark.

Procaine-Epinephrin Tablets, (Novol).

Manufactured by the Novocol Chemical Company, Brooklyn, N. Y. No U. S. patent or trademark.

Procaine-Epinephrin Tablets, No. 1: Each contains procain hydrochlorid, 0.02 gm. (⅓ grain), epinephrin, 0.000045 gm. (1/1500 grain). Each tablet dissolved in 1 c.c. (16 minims) of physiologic salt solution or Ringer's solution will yield a solution of procain hydrochlorid, 2 per cent, and epinephrin, 0.000045 gm. per cubic centimeter.

Procaine-Epinephrin Tablets, No. 2: Each contains procain hydrochlorid, 0.02 gm. (⅓ grain), epinephrin 0.00002 gm. (1/3300 grain). Each tablet dissolved in 1 c.c. (16 minims) of physiologic salt solution or Ringer's solution will yield a solution of procain hydrochlorid, 2 per cent, and epinephrin, 0.00002 gm. per cubic centimeter.

Procaine-Epinephrin Tablets, No. 5: Each contains procain hydrochlorid, 0.05 gm. (¾ grain), epinephrin, 0.000083 gm. (1/800 grain). Each tablet dissolved in 2.5 c.c. (40 minims) of physiologic salt solution or Ringer's solution will yield a solution of procain hydrochlorid, 2 per cent, and epinephrin, 0.000033 gm. per cubic centimeter.

Procaine-Epinephrin Tablets, No. 6: Each contains procain hydrochlorid, 0.125 gm. (1⅞ grains), epinephrin, 0.000125 gm. (1/533 grain). Each tablet dissolved in 10 c.c. (160 minims) of physiologic salt solution or Ringer's solution will yield a solution of procain hydrochlorid, 1.25 per cent, and epinephrin, 0.0000125 gm. per cubic centimeter.

Procaine-Epinephrin Tablets, No. 10: Each contains procain hydrochlorid, 0.02 gm. (⅓ grain), epinephrin, 0.000045 gm. (1/1500 grain) and sufficient sodium chlorid to cause the resulting solution to be isotonic and to contain procain hydrochlorid,

2 per cent, and epinephrin, 0.000045 gm. per cubic centimeter when dissolved in 1 c.c. of water.

Procaine-Epinephrin Tablets, No. 12: Each contains procain hydrochlorid, 0.02 gm. (⅓ grain), epinephrin, 0.00002 gm. (1/3300 grain) and sufficient sodium chlorid to cause the resulting solution to be isotonic and to contain procain hydrochlorid, 2 per cent, and epinephrin, 0.00002 gm. per cubic centimeter when dissolved in 1 c.c. of water.

TRICHLORETHYLENE

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Trichlorethylene was submitted to the Council by the Calco Chemical Company. (A partial review of the literature was submitted by the company.) The existing evidence (mostly of a clinical nature) purported to show that the fumes of this substance, when inhaled, possessed a selective pharmacologic affinity for the fifth cranial nerve. This selective action expressed itself, after administration of the drug, in a lowered sensitivity of the skin and mucous membranes supplied by the various branches of the trigeminus to both pain and tactile stimuli. Accordingly, various clinicians following Plessner (1916) proceeded to treat trifacial neuralgia with this drug. The therapeutic results varied from reports of lasting relief from attacks of this painful malady and reduction in the number and severity of the attacks, to reports indicating no observable relief, particularly in cases involving the mandibular divisions of the nerve. Because of the more promising results, it was suggested that the drug be tried in all cases of trifacial neuralgia before resort to more radical operative treatment.

Two other facts are of interest and significance. The drug, on inhalation, is capable of producing in laboratory animals an anesthetic state. The available evidence furthermore indicates that even when it is administered repeatedly to a given animal to the point of general narcosis, no deleterious after-effects result. When its administration is pushed far beyond all reasonable limits, death may result from respiratory paralysis. Since the recommended therapeutic dosage in trifacial neuralgia lies between 20 and 40 drops by inhalation, it is obvious that narcosis was effected not with pharmacologic or therapeutic dosages but with toxicologic quantities.

If trichlorethylene possessed the selective action on the trigeminus claimed for it by its proponents, the dental profession might be interested in the use of this drug as a palliative agent in those affections of the teeth and gums which give rise to pain, since the gums are all supplied by branches of the trifacial nerve. It is conceivable that the exodontist might, after multiple extraction, give or prescribe to his patient, several ampuls of trichlorethylene containing therapeutic doses of the drug with proper instructions for their use by inhalation should postextraction pain make the patient more than uncomfortable; but before this is instituted in general practice, more evidence of a clinical nature is desirable.

The statements concerning the alleged selective action of the drug seemed

to rest on an uncertain scientific basis. The referee therefore proposed to investigate these claims by direct examination of the pharmacologic properties of this drug on himself and any volunteers for experimentation. This course seemed desirable and necessary since there is available a method for studying tactile and pain sense which allows the experimenter to express tactile and pain sensation quantitatively.

Years ago, von Frey devised his so-called test hairs (one set for testing touch; the other for pain). Suffice it to say that in each set a hair or bristle is mounted on and at right angles to a wooden handle. A number of different hairs or bristles properly calibrated belong to each respective set. Each set of hairs (for touch or pain) consists of a series which denotes a progressive diminution in sensitiveness either to pain or to touch. In the case of touch, the diameter of the hair varies; in the case of pain, the force exerted before bending varies, the cross-section of all the bristles being the same.

The general scheme of experimentation was as follows: Minute dots were made with India ink on the skin in and outside the trigeminal area. These landmarks insured testing exactly the same spot in successive trials or experiments. The following areas were tested for their sensitivity to pain and touch; upper eyelid, center of chin, ear, cheek, side of neck, center of upper lip, angle of mouth, eyebrow, tip of nose, forearm (under surface) and tip of index finger (dorsal surface). These areas differed markedly in their sensitiveness to both tactile and painful stimuli. Attention is called to the fact that four extratrigeminal areas were included in this study, namely, the ear, side of the neck, forearm and finger tip.

After determining and recording the sensitiveness of these parts in a given person while the subject had his eyes closed, 40 drops of trichlorethylene was taken by inhalation. For this purpose, the drug was put in a small bottle connected by a short glass tube to an inhalation mask. On each inspiration, air passed over the surface of the drug volatilizing a certain (indefinite) amount which was drawn into the lungs. Each subject expired into the room and then in turn inspired from the bottle. This procedure was continued until the bottle was empty.

The first inhalation caused a choking sensation which soon passed off with succeeding inspirations. But as this irritant action passed off, the majority of the subjects (about eight) were seized with a feeling of dizziness, giddiness or actual numbness. The referee himself felt as though he were in the first stages of what might soon be a general anesthetic state.

As soon as the last drop of the drug had been volatilized, the sensitiveness of the previously mapped area was again determined.

The results are briefly summarized:

1. Trichlorethylene in doses of 40 drops taken by inhalation has no effect on tactile sensitivity.
2. Sensibility to pain is, on the other hand, markedly diminished.
3. The drug, trichlorethylene has no selective action on the trigeminus nerve. Painful sensibility in the extratrigeminal regions is equally impaired.
4. Areas of low normal sensitivity used in comparison with some of the trigeminal areas were depressed more than more sensitive areas in the trigeminal area.
5. This partial analgesia in and outside the area innervated by the trigeminus may last from thirty minutes to several hours, the time depending on the individual.

6. A second administration of the drug shortly (one-half hour) after the first possesses no noticeable additive effect. The method does not reveal a cumulative effect. Neither do repeated inhalations on consecutive days show a progressive depressing effect on the sensibility of an area toward painful stimuli.
7. In such doses as were used, trichlorethylene was more effective than ether, acetylsalicylic acid (aspirin) or amidopyrin (pyramidon) in dulling pain sensation. In one instance, the referee produced toxicologic symptoms on himself from 15 grains of amidopyrin (pyramidon) taken on an empty stomach. In spite of this, both tactile and pain sensations were virtually normal.

The subjective phenomena accompanying the inhalation of the drug suggest a central action. Even in the small dosages recommended, the drug gives all the indications of a centrally acting anesthetic (buzzing in ears, sense of fullness in the face, dizziness, mental confusion, giddiness). The complete anesthesia effected in certain laboratory animals more than bears out this supposition or interpretation. It does, furthermore, not seem very probable that the therapeutic doses used could dull the sensibility of peripheral nerves.

If this interpretation is correct, we are in a position to explain the supposedly beneficial results observed in *certain mild cases of trifacial neuralgia.* Since the central depression may persist for hours and since it is recommended that the drug be used three times a day, the patient by inhaling the drug repeatedly may maintain the center in a more or less depressed condition, with the result that the usual number of attacks or their severity or both are reduced. This interpretation of the clinical findings on the basis of the referee's experimental data might be satisfactory were all attacks of trifacial neuralgia brought on by painful stimuli. As a matter of fact, in the trigger or dolorogenetic zones an attack is usually induced by tactile stimuli; and it will be recalled that trichlorethylene (in the doses recommended by clinicians and used by us) ***had no effect on tactile sensibility.***

Dose for dose, by inhalation, trichlorethylene is not nearly so toxic as is chloroform as far as effects on blood pressure and respiration are concerned. In fact, the referee finds that in therapeutic doses trichlorethylene has virtually no effect on the blood pressure and respiration of the dog.

Because of these facts, the referee recommends that trichlorethylene be given further trial in the clinic. It would be unwise to discourage further trial as far as the council is concerned, particularly when the evidence so far obtained, including that of the referee, indicates that such further tests are free from danger to the patient. As far as is known, no attempt has been made to use trichlorethylene in general dental practice. Perhaps the findings here reported may suggest a possible use in dentistry along lines suggested by the supposedly promising results obtained in the medical clinic.

In commenting on the report, it was suggested that, in making clinical trials, both tests of renal and of liver functions and of resistance of erythrocytes to hemolytic agents be made, because the ethylene compounds of the type of trichlorethylene are irritating and cause hemolysis.

BUREAU OF CHEMISTRY

MORE MISBRANDED DENTAL NOSTRUMS

EL-BE ORAL MOUTH WASH

IN December, 1930, the Whitman Pharmacy, Camden, N. J., shipped into Pennsylvania a quantity of El-Be Oral Mouth Wash, which the Government alleged was misbranded in that the following statements on the label were false and fraudulent: "For Pyorrhea, Strengthens Soft and Bleeding Gums, . . . For Pyorrhea, Soft and Bleeding Gums."

Analysis of the product by the Government chemists showed that it consisted essentially of guaiacol, anise oil, alcohol, and water, colored pink.

In March, 1931, judgment of condemnation and forfeiture was entered and the court ordered that the product be destroyed. (Notice of Judgment 17913, issued, June, 1931.)

ZI-O-DINE DENTAL CREAM

The Iodine Products Company, Laurel, Miss., shipped in January, June and August, 1930, various lots of Zi-O-Dine Dental Cream into Alabama, which the Government alleged were false and fraudulent since Zi-O-Dine Dental Cream contained no ingredient or combination of ingredients capable of producing the effects claimed: "You won't have False Teeth if you start using Zi-O-Dine Now, Heals Bleeding Gums; . . . Checks Pyorrhea, Heals Sore Bleeding Gums, Prevents Decay; . . . Zi-O-Dine is Guaranteed to Prevent Bleeding Gums. . . . In a few days the gums will be sufficiently healed to use a brush; . . . The Infection that causes sore, bleeding and soft gums is one of the deepest and most stubborn troubles dentists are called upon to combat. The gums are so constructed that penetration of ordinary medicals are too slight to be effective. That very condition caused the creation of Zi-O-Dine Dental Cream—and the use of enough powerful penetrating ingredients to really be effective; . . . Gum germs are difficult to inactivate therefore only the continued use of Zi-O-Dine—or any treatment, can be expected to be of lasting value."

Analysis of the product by Government chemists showed that it consisted essentially of calcium carbonate, magnesium carbonate, soap, glycerin, small proportions of zinc iodid, peppermint oil, methyl salicylate, alcohol and water. The article was not antiseptic.

In January, 1931, the court ordered that the product be destroyed by the United States marshal. (Notice of judgment 17927, issued, June, 1931.)

Note: The Iodine Products Company, Laurel, Mississippi, also market a product known as Zi-O-Dine Astringent.

DR. C. S. WILLIAMS' EMEDENT PYORRHEA MOUTH WASH NO. 1

The Emedent Pharmacal Company, Ellisville, Miss., shipped in June, 1930, also in July, 1930, a quantity of Dr. C. S. Williams' Emedent Pyorrhea Mouth Wash into Alabama, which the Government alleged contained claims of curative and therapeutic properties that the article did not possess.

Analysis of a sample by department chemists showed that the product consisted essentially of sodium chlorid, boric acid, thymol, extracts of plant drugs, alcohol and water.

The Government alleged that statements regarding the curative and therapeutic effects of the product were false and fraudulent, viz.: "Pyorrhea . . . Used in the Treatment of Pyorrhea; . . . Emedent Mouth Wash No. 1 heals sore gums and sore throat very quickly and is prescribed by the dentists for patients to use while being treated for pyorrhea, trench mouth, or sore gums from any cause. . . . Pyorrhea . . . If you will use this Mouth Wash and Tooth Paste as we recommend you will save your teeth and health by preventing pyorrhea or the formation of pus around the teeth."

In January, 1931, the court ordered that the product be destroyed. (Notice of Judgment 17928, issued, June, 1931.)

Note: The A.D.A. Bureau of Chemistry reported on Emedent Pyorrhea Treatment of Dr. C. S. Williams in October, 1930. It will be recalled that the product was essentially a 41 per cent solution of sulphuric acid.

PYCOPÉ

In November, 1929, July and September, 1930, Pycopé, Inc., shipped from Joplin, Mo., into the State of Louisiana, a quantity of Pycopé which the Government charged was misbranded in violation of the Food and Drugs Act as amended.

Analysis of the product by Government chemists showed that it consisted essentially of sodium chlorid, sodium carbonate, sodium bicarbonate, sodium borate, calcium carbonate, and compounds of iron, aluminum, and magnesium.

The libel alleged that the following statements regarding the curative or therapeutic effects were false and fraudulent: "It saves the teeth . . . For Mouth Health . . . Hardens Soft and Bleeding Gums; . . . There is Little Excuse for Pyorrhea; . . . The Dental profession recognizes Pyorrhea as a condition followed by a complex infection. You can aid your dentist in relieving the condition and preventing the infection by using Pycopé Tooth Powder and Brush. Pyorrhea is a gum disease. You may have beautiful white teeth and yet have Pyorrhea. The correct use of Pycopé Tooth Powder and Brush promotes mouth health, by raising the natural resistance to the infection. Brush your teeth and massage your gums with these products for three minutes twice each day. Pycopé Products are endorsed by many hundreds of progressive dentists. These authorities, whose knowledge is beyond question, are your assurance of its effectiveness."

In January, 1931, the court ordered that the product be destroyed. (Notice of Judgment 17938, issued, June, 1931.)

Note: The product has been again submitted to the Council with claims radically revised.

SMITH'S KING OF ALL PAIN AND TEX-A-TINE OINTMENT

In October and November, 1930, the Texatine Medicine Company, Enid, Okla., shipped from Oklahoma and Arkansas into Colorado, a quantity of Smith's King of All Pain and Tex-A-Tine Ointment, which the Government charged was misbranded, in that the following claims, in addition to toothache, on Smith's King of All Pain label were alleged false and fraudulent: lumbago, boils, wounds, deafness, quinsy, diarrhea, dysentery; "A Quick and Sure Relief from all Pains."

Analysis of Smith's King of All Pain showed that it consisted essentially of petroleum oils and nitrobenzene; and analysis of Tex-A-Tine Ointment showed that it consisted essentially of petrolatum, a small proportion of menthol, and cinchonidine.

In January, 1931, the court ordered that the product be destroyed. (Notice of Judgment 17971, issued, June, 1931.)

PYOR-HEAL

In October, 1930, the Brander Co., New York City, shipped into the State of Virginia a quantity of Pyor-Heal which the Government charged was misbranded in violation of the Food and Drugs Act as amended, in that the following statements were false and misleading: "Antiseptic and Bactericidal; . . . The beneficial results . . . are due to the combined antiseptic . . . properties of the ingredients . . . through its strong bactericidal strength . . . Laboratory report showing germicidal strength, antiseptic . . . properties." Misbranding was alleged for the further reason that the following statements appearing in the labeling, regarding the curative or therapeutic effects of the article, were false and fraudulent, since it contained no ingredient or combination of ingredients capable of producing the effects claimed: "Pyor-Heal . . . for the Treatment of Pyorrhea (Causing receding gums), Vincent's Angina (Trench Mouth) . . . Beneficial in Allaying Inflammatory Conditions of the Mucous membranes of the Mouth and Throat . . . Pyor-Heal is recommended for home use as a supplemental treatment in conditions of Pyorrhea, Gingivitis, Trench-Mouth, Bleeding Gums, Canker Sores. Pyor-Heal will be found an effective prophylactic if used as a mouth wash and gargle night and morning. Dilute as indicated. . . . Prophylactic after extraction; . . . For the treatment of Pyorrhea (causing receding gums) Vincent's Angina (Trench Mouth), Gingivitis, . . . Bleeding Gums and of benefit in allaying all inflammatory conditions of

the mouth and throat. . . . Pyor-Heal is a remedy and gives results in all inflammatory conditions . . . acting both as a prophylactic and antiseptic for all inflamed conditions of the mouth. . . . Pyor-Heal is specifically indicated as a home treatment after teeth have been properly cleaned by the dentist, in conditions of sore, inflamed or bleeding gums, gingivitis, pyorrhea, etc. Pyor-Heal is recommended not only for the prevention of diseased conditions arising in the gums and mouth, but also as an active remedial agent as its name implies. In the treatment of Pyorrhea both during the height of its symptoms and thereafter as a safeguard against its recurrence. Pyor-Heal if used will almost immediately arrest gum recessions. . . . Pyor-Heal should be used freely in all the following conditions: Pyorrhea, Gingivitis, Tonsilitis . . . Sore Throat, Tender Gums, Spongy Gums, Bleeding Gums, Turgid Gums, Loose Teeth, Abscesses, Salivation . . . Canker Sores, Diphtheria, Quinsy . . . Pyor-Heal is a remedy. . . . For Pyorrhea, Gingivitis, Bleeding, Swollen or Receding Gums, or Loose Teeth, and after extractions, use one teaspoonful undiluted after meals and before retiring, until the acute symptoms have subsided, churning the liquid between the teeth and around the gums, for several minutes. . . . This treatment will be found very beneficial for Sore Throat, Hoarseness, Canker Sores."

Analysis of Pyor-Heal by Government chemists showed that it consisted essentially of small proportions of phenols, resins, and sodium hydroxid, and water. The article was not an antiseptic nor a bactericide.

In March, 1931, the court ordered that the product be destroyed. (Notice of Judgment 18032, issued, July, 1931.)

LORTY ANTISEPTIC TOOTH PASTE

In September, 1930, B. F. Allen Co., New York City, shipped from New York into Maryland a quantity of "Antiseptic Tooth Paste . . . Lorty," which the Government charged was misbranded in violation of the Food and Drugs Act, in that the statement "Antiseptic Tooth Paste" was false and misleading, and because the statement "Helps prevent pyorrhea" was false and fraudulent.

Analysis of a sample showed that it consisted essentially of calcium carbonate, soap, potassium chlorate, glycerin, water, flavoring material including peppermint oil, and a red dye. The article was not antiseptic.

In March, 1931, a claimant having appeared for the property, the court entered judgment of condemnation and forfeiture and ordered that the product be released to the claimant on payment of the costs and execution of the bond conditioned in part that the product be relabeled and not to be sold or disposed of contrary to law. (Notice of Judgment 18034, issued, July, 1931.)

BUREAU OF PUBLIC RELATIONS

TOOTHFULLY EDUCATED STUDENTS AND PARENTS

By GEORGE H. WANDEL†, D.D.S., Chicago, Ill.

PATRONS ARE REQUESTED TO FAVOR THE COMPANY BY CRITICISM AND SUGGESTION CONCERNING ITS SERVICE 1201-S

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable sign above or preceding the address.

WESTERN UNION

NEWCOMB CARLTON, PRESIDENT J. C. WILLEVER, FIRST VICE-PRESIDENT

SIGNS

DL = Day Letter
NM = Night Message
NL = Night Letter
LCO = Deferred Cable
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WLT = Week-End Letter

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1931 DEC 16 PM 11 39

MINUTES IN TRANSIT

FULL-RATE	DAY LETTER

CEA316 49 NL=CEDARRAPIDS IOWA 16

DR GEO H WANDEL=

SUPR AMERIGAN DENTAL ASSN 212 EAST SUPERIOR ST

CHICAGO ILL=

YOUR IOWA HEALTH WORKERS THE WOODROW WILSON GIRLS REACHED THE HUNDRED PERCENT GOAL IN GOOD TEETH TODAY THIS IS THE EIGHTH YEAR IN SUCCESSION THAT THEY HAVE ACHIEVED THEIR GOAL THEY HAVE PROVED THAT STUDENTS AND PARENTS CAN BE SO TOOTHFULLY EDUCATED THEY CAN CONDUCT THEIR OWN TOOTH CAMPAIGN=

WOODROW WILSON GIRLS.

WESTERN UNION GIFT ORDERS ARE APPROPRIATE GIFTS FOR ALL OCCASIONS

WHAT a message! It reads almost like a fairy-tale. Think of it! Eight successive years of 100 per cent O. K. mouths. That is the record of the girls in the Woodrow Wilson Junior High School of Cedar Rapids, Iowa, from whom the telegram above was received. It is a record of which they may well feel proud.

In the April, 1929, issue of THE JOURNAL, page 737, will be found an article entitled, "How the Wilson Students Reached the One Hundred Per Cent Goal in Good Teeth." This arti-

†Supervisor, Bureau of Public Relations, American Dental Association.

A small group of Woodrow Wilson Junior High School girls. Standing, above, center, is their captain of captains, Kathleen Berry. Sitting to the right of the aeroplane is Blanche Stolba, whose interesting description of their campaign for 100 per cent good teeth in their school is included in this article.

cle was written by Henrietta Frank, who is the physical instructor in the above-mentioned school. If, by chance, this article has never been read by some of THE JOURNAL'S readers, they should look it up and read it, because it paints a vivid picture of what can be done through education and well directed enthusiasm in molding the mouth hygiene habits of school children. To read that article will assist present readers to more thoroughly appreciate the remarkable accomplishment recited in the telegram above.

During the previous seven years, the 100 per cent O. K. records were obtained by the girls under the close direction of their teacher, Miss Frank. This year, for various reasons, the teacher was forced to limit her activities and the dental program was one of those that had to be sacrificed. This was indeed a disappointment. But disappointment was soon turned to happiness when it was realized that the pupils desired to carry on their own program. This explains the statement made in the telegram "They have proved that students and parents can be so toothfully educated they can conduct their own tooth campaign."

After receipt of the telegram, we wrote for information as to how these girls had gone about their task of reaching the 100 per cent goal. We asked them to write a description of their campaign and several of the girls complied with our request. Their papers were all excellent and we hardly knew which one to select for inclusion in this article. The following account by Blanche Stolba, a student in the 9A grade, makes very interesting reading.

Hurrah! We have reached the 100 per cent goal in good teeth.

Our promoter, Miss Frank, who is our good friend and teacher, had faith in us, believed in us, inspired us and created a desire within us to put this project across.

First, we had to believe in the idea and know its good points before we could sell it. Our selling points were that good teeth make (1) better health, (2) better students, (3) better athletes and (4) better looks. We also realized that we had to put backbone, not wishbone, into the work. After Miss Frank sold the idea to us, we in turn sold it to our parents and inspired them to cooperate with us.

Next, we had to organize ourselves and elect leaders (captains) for each grade, all the elementary schools and all newcomers. These captains were elected to stimulate interest in our project should any be lacking. But no interest was lacking, as the leaders soon learned. A captain of captains, Kathleen Berry, was elected to be commander over all the other captains.

We had to be sure that all the girls would catch the spirit of enthusiasm and be ready to cooperate, so we put our school slogan to work: "Whatever we do we all do, and we all do it **together.**"

To have a real campaign, there must be a campaign slogan. The slogan for our campaign was, "Remember that American ends in I can."

A means of arousing and holding the girls' interest was a large display case, with three glass shelves, that was brilliantly lighted. For the background, there was a large placard with the words, "The key to our success is cooperation." In this display case was an aeroplane race. Each of the fifteen classes had a private aeroplane. The aeroplanes started on the bottom shelf. They soared higher to the second shelf and still higher until they reached the third shelf, which was the 100 per cent goal. Our chief indoor sport for several weeks was watching this aeroplane race. In this display was also a tooth thermometer showing the percentages of the classes. A standard containing test tubes filled with colored water also showed the standing of the classes. All the O. K. cards were placed in the case, and attractive posters were seen here and on all the bulletin boards.

But alas! When almost through, we found a few girls who through financial difficulties could not go to the dentist. But did that stop us? Not at all! We just buckled down to find a way by which to send these girls

to a dentist, because such a small thing as money matters couldn't stop us when we were so near our goal. So we found ways for the girls to earn money to pay their dental bills.

The sensation of the good teeth season came when the students in a room reached the 100 per cent goal. As a reward, the girls were permitted to wear large gay colored tarlatan bows.

The goal so long sought for at last was reached. We were so happy and proud that no words could express our feelings. Such an accomplishment called for noise such as was never before heard in the Wilson "camp." The captain of captains and the 9A girls went to every home room, rang a huge dinner bell, and at a sign from the yell leader, we yelled, "2-4-6-8. What do we appreciate? Good Teeth! Good Teeth! Good Teeth! Rah! Yea—Good Teeth!"

But the big thrill was left to the very last when we could send a wire to our interested friends, President Hoover, Dr. Wandel and Dr. Gardner. Then, the greatest thrill of all came when these loyal and staunch friends of many years wired us their congratulations.

The Wilson girls certainly are proud and happy and intend always to hold high this standard of good teeth in our school.

We are sorry that we cannot include all the papers, but space does not permit. A letter from Miss Frank brings some interesting sidelights into the picture. She writes:

The girls tell me that on the opening day of school in September, 64 per cent of them brought their O. K. cards. Of course, you must realize that many of the girls' fathers are out of work this year. . . . Kathleen Berry, captain of captains, who is 14 years of age, never once let other interests interfere with this good teeth project. On Saturdays and after school, she would take the girls whose fathers were out of work to the dentists to have their teeth examined and find out the exact cost. One Saturday, about twenty girls were to go to the dentist, so twenty 9A girls met these younger girls at their homes and acted as their escorts. Although it was necessary for me to call the dentists and tell them the bills would be paid, Kathleen made all of the appointments for the girls. The 9A girls had charge of raising the money and paying the bills. . . . Truly, this accomplishment of the Wilson girls and their parents is evidence of a wonderful spirit and I regard it a great privilege to teach in such a community. I must not forget to mention the wonderful cooperation and kindness shown by the local dentists. Much of this work was done at reduced fees.

This remarkable story has been given publicity because we believe it will give ideas as well as encouragement to others endeavoring to make their communities "tooth conscious." It substantiates our contention that proper oral hygiene instruction and persistence in the development of correct habits in the care of the teeth is the most important phase of any mouth hygiene program. It proves that once a community has learned the meaning of a clean, healthy mouth, it will go to the limit to enjoy that blessing. Finally, it shows the wonderful possibilities that are within the reach of every public school teacher who cares to interest herself in the health of her pupils.

"MAY DAY—NATIONAL CHILD HEALTH DAY"

By GEORGE H. WANDEL, D.D.S., Chicago, Ill.

"SUPPORT Your Community Child Health Program: It Protects Your Home." These are the words that are chosen as the slogan for May Day-National Child Health Day, 1932. To members of the dental profession, these words should act as an instant stimulus to greater efforts along child health lines. In fact, it is a professional challenge which should be taken up by every dentist in every community in the United States.

May Day-National Child Health Day is celebrated each year on the first day of May. It is the yearly focusing point for the purpose of calling to the attention of everyone the fact that in the health of its children and the protection of motherhood lies the future of the nation. On that day, all over the country, special efforts are made through talks, programs, distribution of literature and every other known device to rekindle the public interest in the problem of child health. Some communities and states even go so far as to designate a whole week for this purpose, beginning or culminating their efforts on the first day of May.

There are three points which have been selected by the May Day Committee of the State and Provincial Health Authorities of North America for emphasis this year. They are: *nutrition of children, the importance of an adequate clean and safe supply of milk, and the protection of motherhood.* These are all questions of the greatest interest to members of the dental profession.

Every dentist knows and appreciates the importance of proper nutrition for children. There is never a mention of child dental problems but that this question stands out as the most important factor. Without proper nutrition, a child is almost sure to suffer tooth disturbances, such as delayed eruption, caries, malocclusion and, in many instances, lesions of the gums. Dentists, especially in recent years, have learned to look beyond the confines of the mouth and appreciate full well the effects of malnutrition on the rest of the body. They know that general physical well-being and healthy oral structures go hand in hand.

In our present state of economic stress, when thousands of children are undoubtedly being fed on inadequate diets, dentists should be more alert than they have ever been in checking up on the nutrition of their little patients and in offering practical advice in that respect. Considering this fact, we would call the profession's attention to a folder on emergency food relief and child health that was recently issued jointly by the United States Children's Bureau and the United States Bureau of Home Economics. In this folder, emphasis is placed on the importance of an adequate diet and on the fact that if, only temporarily, family budgets do not seem sufficient to provide adequate diets, at least enough money should be allowed to provide the

"irreducible amounts" of protective and other foods below which it is not safe to let the diet fall even for short periods of time. The folder outlines the minimum weekly food needs for a family of three, five and seven, taking into consideration the presence of children. In addition, it states what these same families should eat when the diets are below the minimum requirements. Every dentist should obtain copies of it for his own enlightenment as well as for distribution where needed. Copies of this folder may be obtained without charge by writing to the United States Department of Labor, Children's Bureau, Washington, D. C. The name of it is, "Emergency Food Relief and Child Health."

Taking into consideration the second point of emphasis brought out by the May Day Committee, namely, "the importance of an adequate, clean and safe supply of milk," we feel certain that every member of the profession will realize the necessity for supporting constructive efforts in that direction. It is universally accepted that milk offers the most completely acceptable nutrients for the child's diet and that it is the principal source of tooth building materials. It is also apparent that unless milk is clean and free of disease producing organisms, it may prove a serious menace to child health. Therefore, dentists everywhere should aline themselves with the proper authorities and fight for safe milk in their communities. Especially is this stand necessary in small towns and rural communities where adequate pasteurization of milk is not usually required.

The third point mentioned for emphasis by the May Day Committee is the "protection of motherhood." Here, also, the dentist can do a great amount of good. To expectant mothers, he can urge early and constant attention by a reliable physician. He can, in cooperation with the physician, advise these patients as to the type of diet to follow for the protection of their teeth and health and for the development of good teeth for the child. He can instruct the mother in the proper home care of her teeth and gums; and, finally, he can give her the type of dental attention that will assure the health, efficiency and comfort of her masticatory machine.

At this point, it would be well to review some of the important factors to be considered in the dental care of expectant mothers.

Many expectant mothers experience an increased tendency to tooth decay and irritation of the gums. It is during the earlier period of the pregnancy that we are most apt to find this true. Women who are noticeably afflicted are those in whom we find digestive disturbances associated with nausea and vomiting, who show indisposition and loss of energy, who have a loss of weight accompanied by more or less physical deterioration and who have neglected to take proper care of the teeth. After this disturbing period of the pregnancy is past, there is frequently a general physical improvement accompanied by a betterment of tooth and gum conditions.

Early and regular dental attention is of prime necessity to the expectant mother. As regards the care that should be given her, there are five things that are important. 1. The teeth should be thoroughly cleaned. 2. All decay should be removed and the resulting cavities filled. 3. All areas of infection should be properly taken care of either by treating or by the extraction of the teeth so involved. 4. Any gum irritation should be properly treated. 5. The patient should be cautioned to return to

her dentist as often as he deems it necessary in order to keep her mouth in a healthy condition.

We cannot emphasize too strongly the importance of locating and eliminating areas of focal infection. In these cases, roentgen-ray examination is certainly advisable, giving special consideration to abscessed teeth, pieces of roots, pulpless teeth, teeth with large restorations, unerupted teeth and all periodontal involvements. There is strong evidence that oral infection has frequently contributed to such serious conditions as toxemia, eclampsia and abortion. Such results are most likely to occur in the case of the woman who is in a poor state of health, or has experienced a toxemia, eclampsia or other serious disturbance during a previous pregnancy.

Right here, we wish to discourage the old fashioned notion that it is dangerous to render dental service to an expectant mother. Authorities on obstetrics advise us that most dental operations may be performed with safety but that it is not best for the expectant mother to undergo protracted and fatiguing sittings. They also state that, if possible, the extraction of teeth is best performed under local or conduction anesthesia rather than under some general anesthetic. A study of existing information affords strong evidence that it is far more dangerous to neglect teeth at this time than it is to give them the necessary attention. Of course, it is taken for granted that discretion will always be exercised, and that if the case calls for any serious operative procedure, the physician will be called into conference.

Thus far we have dealt largely with dentistry's May Day responsibilities from the office practice standpoint. There is another phase of our professional representation in May Day activities that might be termed "public relations." As we have previously stated, there are many communities and states that are developing comprehensive programs of activities in commemoration of this child health day. Nearly all of these programs call for talks on various phases of child health, but too often it is observed that dentistry is not given consideration. Also, in conjunction with these May Day programs, efforts are exerted to get as many children as possible to obtain health examinations. Sometimes this is accomplished by urging parents to take their children to the family physician, and sometimes by organizing a temporary clinic for that purpose. Here, also, it has often been observed that dentistry has not been included. Who is to blame for these failures to recognize dentistry as a part of child health service? We believe that, in many instances, the dental profession itself is at fault. Too often have we noted failure on the part of members of the profession to interest themselves in community health activities. They have been remiss in failing to impress on the public the fact that dental care is an important part of all health service. They have neglected to volunteer their aid in the conduct of local health programs and, if that proffer of assistance was ignored, to insist on the right to participate. In this connection, we have often heard the lame excuse offered, "We didn't participate in the program because we were not invited." Any one who is familiar with public health work knows that invitations usually come when they are sought and, frequently, that the seeking must be of a firm and persistent character. We have the necessary professional aggressiveness in many parts of the country, but there are still many localities where these things are treated with entirely too

much resignation and indifference. We need a national professional alertness, with a public health point of view, today more than we have ever needed it, and one way to develop it is to give enthusiastic cooperation to such laudable movements as May Day-National Child Health Day.

There is just one other idea which the May Day Committee has brought out in its discussion of this annual child health demonstration: To be really worth while, the educational efforts expended on that day should lay the cornerstone to something of a permanent nature. It should be the aim to evolve a program for child health that will make every day of the year a child health day. From a dental standpoint, this offers a wonderful opportunity to pave the way for dental activities in public schools, hospitals and other public institutions dealing with children. It is an opportunity which should not be overlooked but should be followed up with never ending persistence. Naturally, it is wise to work out the plans with due consideration to the other child health activities, contemplated or in existence. The important thing is to do something, always keeping that possibility of a permanent program in mind.

May Day-National Child Health Day will soon be here. May it light the way to the security of life and health of American motherhood and to the health and happiness of every American child! May the dental profession, everywhere, contribute its share toward making that day a success!

HOSPITAL DENTAL SERVICE IN THE OUTPATIENT CLINIC*

By SIGMUND W. A. FRANKEN,† D.D.S., New York City

LET us consider hospital dental service in the outpatient clinic from the standpoint of the organization, set-up and functioning of the dental division of the outpatient department of a general hospital.

One can easily weave theories in the abstract on how a dental clinic should be organized and conducted. Innumerable pamphlets have been published on standard procedures in clinics. Indeed, I know of men who, although they have never been active in a clinic, undertake to write of its equipment and operation. But I wish to give you neither additional theorems nor doubtful hypotheses, but rather a description of a clinic that has been in existence for more than twenty-five years and which has slowly evolved from a one-chair, one-man, small-room service to a modern, large clinic with from approximately thirty to forty men in its service; namely, the dental division of the outpatient department of the Lenox Hill Hospital in New York City.

It is not necessary to go into minute

*From the Dental Service of the Lenox Hill Hospital.

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 22, 1931.

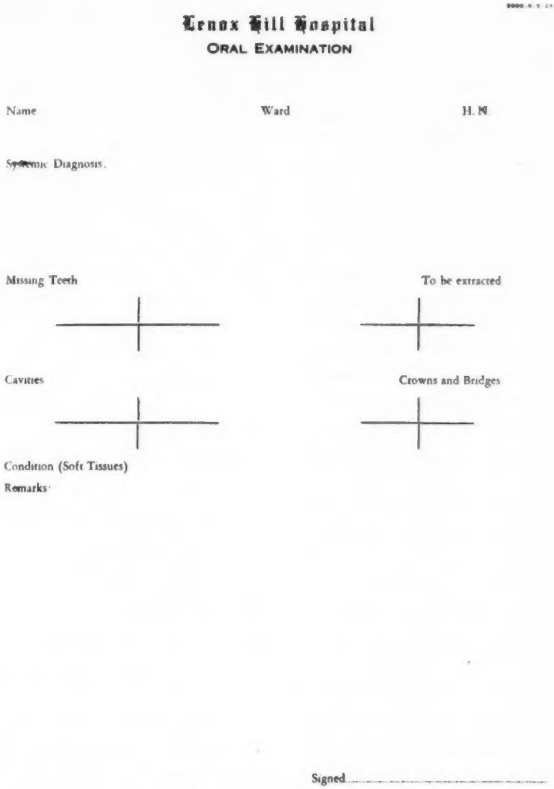
†Attending Dentist to the Lenox Hill Hospital.

detail regarding the various steps of its progress. Allow me instead to describe it at its present stage of development.

ORGANIZATION AND PERSONNEL

The director is also the director for the dental division for ward patients, and thus a close cooperation is maintained between the hospital proper and the dispensary. He is responsible to the medical board and the board of trustees for the conduct of the dental division. This rule was firmly established at the very outset, since the fixing of responsibility on one individual assures better functioning. This does not mean that others on the staff do not assume their full measure of responsibility, but merely that final decisions must be referred to the attending dentist, who is in full authority. To properly fill his position, he must devote at least two or three sessions a week to the clinic.

In addition to the director, there are two chiefs who take charge on alternate days of the week. They, in turn, are


Lenox Hill Hospital
ORAL EXAMINATION

Name Ward H. N.

Systemic Diagnosis.

Missing Teeth

To be extracted

Cavities

Crowns and Bridges

Condition (Soft Tissues)

Remarks

Signed

Dental record sheet.

aided by two assistant chiefs, and next in line are clinical attendants and assistant clinical attendants. Finally, there are volunteer workers, who must give service to the hospital for two years before they receive official appointment. A nurse to sterilize the instruments and a social worker to take the histories complete the staff.

EQUIPMENT

We have four modern chairs and units, each unit containing an engine, light, bracket table, cuspidor, gas outlet and air cutoff. There is a minimum amount of office equipment, consisting of a desk with its chair and three chairs for patients. There is a costumer for patients' outer garments, and a hook-strip at one end of the operating room for operators' coats and hats. There are two large sterilizers, two white-enameled and two portable steel tables on large casters and two steel cabinets for current roentgen-ray films. There are two large wall cabinets for instruments, drugs and dressings, and on one side wall there is a glass cabinet containing interesting models and specimens—in other words, a miniature museum, which is in charge of one of the clinical attendants. The operating room has four large windows.

Outside the operating room, there is a large well-ventilated waiting room containing about eight benches, each of which seat from five to seven people. This waiting room is shared by the dental and cardiac department.

The filing system is of the central type; that is, every patient admitted to the outpatient department is registered and his general history is taken in the main entrance hall. If the patient requires dental treatment, he is referred to the dental room and his record envelop is sent there. Examination of the patient is made by a dentist in the dental operating room and the findings are entered on the dental sheet, which is incorporated with the general record. When the patient is discharged for that session, he is told when to return, and his record is sent to the central filing office. At subsequent visits, the entire envelop is again sent to the dental room and the same procedure followed, except, of course, that there is no need for a second general examination.

The dental sheet used at the Lenox Hill Hospital has been described in a previous article,[1] but because of its simplicity it should, I believe, again be recommended. It is the same as that used for the ward patients and is made the same distinctive color, light green, so that the dental record may be quickly and easily selected by any physician of the other departments that use the general record. It is a single sheet, 8½ by 11 inches, containing blanks to be filled in with the name, age, history number and date. In the center of the chart are four sets of crossed lines, the first of which denotes the missing teeth, the second those having cavities, the third those to be extracted, and the fourth those carrying crowns and bridges. The system for marking the teeth is one which divides the mouth into quarters, numbering the teeth from one to eight, starting at the central incisor and ending with the third molar. It is shown as though the patient were facing the operator with his mouth open. Thus, the upper right central incisor would be indicated in the upper left quadrant of the cross, and numbered one. Below these crosses, spaces are set aside to note the condition of the soft parts, the pres-

1. Franken, S. W. A.: Lenox Hill Hospital Plan for Dental Care of Hospital Patients, J.A.M.A. 83:1866-1868 (Dec. 6) 1924.

ence of abnormalities and the work already done.

ROENTGENOGRAMS

One of the primal aims of the dental service is to establish an equality with the other clinics of the outpatient department. All dental roentgenograms are made by the roentgenologic department of the hospital, since none of the other departments is required to do its own roentgen-ray work. Moreover, since we have more than twenty-five appointed dentists and about ten or fifteen volunteers, it is obvious that, with so large a staff, it would be impossible to run an x-ray machine without a great deal of damage to the machine, and, possibly, to the patients as well. It is very easy to say "assign one dentist to this work," but since we do not pay our operators, it would be an imposition to request the daily attendance of any one man. Therefore, I have refused to accept an x-ray machine until such time as a technician can be loaned to operate it and develop the films.

CLINIC HOURS AND TYPES OF WORK

For many years, the clinic opened at 1:30 daily and closed at about 3:30. At present, in addition to these same afternoon hours, the clinic is held on four week-day mornings.

The afternoon sessions are devoted only to surgical work, and although the major part of it is given over to extractions, cases of fracture, cysts, epulides, etc., are also accepted. Cases of malignancy are immediately referred to our surgical department in the ward service.

Tuesday and Thursday mornings from 9 to 12 have been set aside for a special clinic for pyorrhea cases, and only these cases are treated, unless some emergency arises, in which case palliative treatment is instituted. Wednesday and Friday mornings have been set aside for children. No adult cases are treated, with the usual exception of emergency cases. In the children's clinic, everything is done excepting orthodontia; that is, the various plastic fillings, extractions under procain and ethyl chlorid general anesthesia and prophylaxis. When necessary, dietary instructions for the child are given to the parent.

I have been asked at various times to institute a division for orthodontia. This matter has been weighed carefully and a decision reached against it. First, the length of time required to bring this work successfully to completion renders the cases unsuitable for hospital treatment. Secondly, there is always the possibility of inviting complaints and suits against the institution for not having completed the work to the satisfaction of the child's parents. It is not generally known, nor is it shouted from the housetops, that several New York City hospitals have, within the past few months, been sued on account of work done in their orthodontia departments. Even if there is no ground for the suit, defense must be made, which is not only expensive but also causes unpleasant notoriety for the hospital.

No prosthesis is attempted at the Lenox Hill Hospital, for the reason, in addition to those given against the establishment of an orthodontia clinic, that the dental department is on an equal basis with the other departments of the hospital, and, as far as I know, no general hospital acts as optician to the patients of their opthamologic department, nor does any department make crutches and trusses for patients needing these appliances.

Root canal treatment is not attempted, with the exception of an occasional case

in which root resection is contemplated. Root canal therapy is still debatable ground. It also requires such lengthy treatment that we do not consider it feasible for clinic work until such time as a simple, rapid and certain technic is evolved. Of course, if a clinic belongs to one of the large foundations where money is of no consequence and the operators are paid for their services, it might be a different matter; but, even then, it is doubtful that such work should be undertaken.

No permanent fillings are made for adults. Temporary ones are occasionally inserted where necessary. The reasons for this are the same as those given against prosthodontia.

Although we have excluded these types of work from the clinic, we have found a way to accommodate indigent patients who need fillings, prosthetic appliances, root canal work and orthodontic treatment. All our dental interns, when they graduate from the hospital, are accepted on the staff of the outpatient department, and the last man on the staff receives these patients in his office, sometimes at a fee barely covering the cost of material. It is, of course, understood that, should the dentist find the case beyond him, he will ask and receive help from one of the older men on the staff.

POLICIES OF THE CLINIC

As there is no salary nor honorarium paid to the dentists at the Lenox Hill Hospital clinic, the work should be made as interesting as possible for them. There are men on the staff who have been in service from ten to fifteen years, and assuredly they must find there a kind of profit other than monetary remuneration.

In most hospital clinics, it is regrettable that the interesting work—one might say, any work more difficult than the extraction of an incisor—is usually kept for the chief or director. If he feels benign, he may pass some of it on to the assistant chief, who, in turn, passes what he does not wish down to the other workers according to their seniority; until, finally, there is nothing left for the younger men but simple extractions. This is unfair, not only to them, but also to the clinic. Those who are already competent are given the work, and those who need the experience are deprived of the opportunity to obtain it. Another noticeable fact is that, in clinics operated in this manner, there is a continuous and heavy turnover of operators, and there are but few men constantly on the staff.

The policy of the Lenox Hill Hospital clinic is different. As the patient is called from the waiting room, whoever has an empty chair receives and examines the patient and fills in the chart. If the operator, whether a recent volunteer or an older man, feels himself capable of performing the work indicated, it is his privilege to do so and to see the patient for any subsequent work. In other words, we try always to have the original operator take care of the patient. If the dentist finds that he needs help, he must go to the senior of the day and request it, or, if the work is beyond him, he transfers the patient to the senior. By this method, even the most uncertain volunteer will gradually gain confidence, and will find himself capable in time of acomplishing increasingly difficult work. There is one inviolate rule, which, fortunately, has had to be enforced only once: If an operator attempts work and bungles it, his immediate resignation from the clinic is expected. In other

words, he must know his own ability and limitations. Thus, he is treated as a mature individual and not as a child. This rule has been in existence for the past ten years, and, as stated before, has had to be enforced but once.

PATIENTS

Acceptance of patients, according to the rules of the State of New York, is based upon their financial status, which is determined before they are seen by the dental department.

Some hospitals limit the facilities of a clinic to patients previously registered in one of the hospital departments. This is obviously inconsistent, since the dental clinic, an integral part of the institution, should enjoy the same privilege of accepting any and all patients in need of help.

STAFF MEETINGS

With the idea that staff meetings should be held at long enough intervals to make the men willing, and even anxious to attend, we call these meetings three times a year, in October, February and May. At these sessions, interesting cases are discussed and at least one of the members reads a ten or fifteen minute paper on an assigned subject. Most of the staff assembles for informal dinner at a restaurant where a private dining room is procurable, and those who do not attend the dinner appear later.

INSTALLATION COSTS

Even though the importance and need of a dental department in a general hospital is now universally recognized, the supposed expense to the institution usually proves the stumbling block. Yet it can be done, as explained in an earlier paper,[2] for $500 or $600, for which amount may be purchased a chair, engine, cuspidor, cabinet and more than a sufficient number of hand instruments and a sufficient quantity of materials.

FEES

The Lenox Hill Hospital charges 50 cents admission, but this is waived for indigent patients. Fees of other hospitals vary according to the geographic location and overhead expenses of each institution.

RÉSUMÉ

Any general hospital can enjoy the benefits of a dental clinic if there is an organized plan preceding its installation.

A dental hygienist is not strictly a necessity at the outset. After the clinic is well established and running, and after expansion has taken place, a hygienist may be employed. Expansion should always be a little less than definitely necessary, on the principle that it is much better to have one or two chairs always busy than three or four chairs sometimes busy.

Occasional staff meetings should be held.

The clinic should be so organized that it is elastic as far as accepting additional operators is concerned. As work is increased, volunteers should be taken on. The work should be so arranged that the equipment is in use both mornings and afternoons, and possibly evenings.

Work such as root canal therapy, orthodontia and prosthodontia should not be attempted.

26 East 36th Street.

2. Franken, S. W. A.: Dental Equipment: Its Cost and Installation in a General Hospital, D. Cosmos, 69:186 (Feb.) 1927.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Roentgen Visualization of the Parotid Gland by Means of Lipiodol Injection: The difficulty attendant on a study of changes taking place in the structure of the parotid gland, which has been responsible for a paucity of material on the subject except as regards calculus, parotitis and tumors, prompted Barsky and Silbermann (*Ann. Surg.,* January, 1932) to seek a method for visualizing these glands. The roentgen rays contribute a considerable amount of information not obtained by any other means in pathologic conditions through the use of lipiodol injections. Exposures are made immediately. Only in the presence of active infection is there any danger from the injection. A complete knowledge of the structure of the glands and their pathology are necessary for the work. The authors regard this method as the only accurate way of determining the exact condition of the gland and its deviations from the normal when diseased. In case of parotid fistula, actual visualization of the ducts is of the greatest aid in determining the course of treatment.

Where We Stand Now in Our Knowledge of Nutrition: According to E. V. McCollum (*M. Searchlight and Sc. Bull.,* January, 1932) the diet, in order to be adequate, must contain thirty-seven elements, all relatively simple substances well known to chemists. If any of these components of the diet are omitted from an otherwise complete food, nutritive failure will supervene, the type of malnutrition resulting being characteristic for each of the thirty-seven nutrient principles. There are consequently at least thirty-seven kinds of deficiency diseases. A number of these have never been adequately investigated. Examples of these conditions are seen in the effect of too little iron in the diet, which results in pallor, due to reduction of the hemoglobin in the blood; the lack of iodin, which causes simple goiter; and the lack of manganese, which has been shown in animals to result in sterility. A vitamin A deficiency primarily affects the epithelial tissues, and thus all secretory glands, i. e., the tear glands, the salivary glands, the secretory glands of the digestive system and the reproductive glands, are affected, injury to the eyes, dry mouth, perversion of digestion and absorption, and sterility, respectively, resulting. In vitamin B deficiency, the nerve tissue is the primary seat of injury. Beri-beri, common among the rice eaters of the Orient has taken millions of lives in the last two thousand years. Experiments on rats have shown that evidence of mental deficiency is the result in the absence of vitamin B, especially in the early stages of existence. It is suggested that since milk is low in vitamin B, infants might benefit from the addition of this vitamin to the diet. The endothelial cells throughout the body are affected by a deficiency of vitamin C. The breakdown of the capillary blood vessels results in hemorrhage in many parts of the body and the effect on bone cells is a rarefication of the bones. It has been observed that in half the time required for scurvy to manifest itself as evidence of this deficiency, marked damage to the odontoblasts, the cells which form the dentin, has resulted. Since in a brief period of inadequate feeding, such changes have taken place, it is conceivable that the death of the pulp might result in a short time under these circumstances, even if the diet were adequate before and after this period of deprivation. The author says: "The frequency of occurrence of devitalized teeth in human subjects leads to the surmise that many people may have wrought permanent injury to their teeth by running short of this vitamin for two or three weeks or longer." A deficiency of vitamin D results in rickets, and the rachitic child is subject to respiratory conditions, in part owing to lack of rigidity of the thorax. Much evidence of an experimental and therapeutic nature is accumulating to support the view that taking a supplemental source of vitamin D raises resistance to infections of several sorts. Recent experimentation on

tuberculous patients in which activated ergosterol, the "mother" substance of cod liver oil, was used, has shown that the general condition is improved, with increase in weight and appetite and lowered temperature. Evidence is that adults can take vitamin D-bearing substances to advantage during the colder months of the year. Experiments of Klein, Kruse and Becker lead to the conclusion that tooth decay is in great measure the result of a faulty blood chemistry and consequently the saliva is not appropriately constituted for the preservation of the enamel. Decay, it is believed, is the result, in most instances, of a diet unsatisfactory as respects calcium, phosphorus and vitamin D content. Sugar contains no proteins, mineral elements or vitamins, being an energy-yielding food only. It is not in itself an undesirable food, but if eaten freely tends to crowd out of the diet other foods which are better constituted to provide the body with the essential nutrients of a properly balanced diet. Such foods as potatoes and rice are deficient in several nutrient elements and must therefore be eaten with certain supplementary foods of unique value in providing what they lack. Three supplementary foods of extraordinary value, which may indeed be called the protective foods, are milk, leafy vegetables and eggs. The author suggests supplementing the infant's diet of milk which has been boiled and so lost its vitamin C content, and which is also deficient in Vitamin B_1, with a little orange or tomato juice from the tenth day on. Cod liver oil or viosterol should supply vitamin D, and early supplementing of the infant's diet with cooked vegetables to supply a supplement of iron and copper is now generally advised. The author recommends the vitaminization of certain foods that form staple articles of diet for young and old. He deprecates the current belief among the uninformed that too much of the potent vitamin D may be ingested, stating that it would be too expensive for food producers to put a large amount of the vitamin in their products, and, furthermore, a patent exists on this product under which a scientific foundation of a large state university directs the process of manufacture of the vitamin and all foods are frequently tested, this being done lest they fail to contain the minimum therapeutic dose of the vitamin.

Nontuberculous Infections of the Lungs: In reviewing the nontuberculous infections of the lungs, Paul D. Crimm (*J. Indiana M. A.*, December, 1931) states that it must be kept in mind that the chief offending organism in some cases of lung abscess and bronchiectasis is the fusiform bacillus. These conditions often follow a Vincent's infection of the upper respiratory tract. According to Baker, the organism is an etiologic factor in bronchial asthma. Castellani is quoted as stating that bronchial spirochetosis is frequently mistaken for tuberculosis, and Vincent that in pulmonary gangrene the fusiform bacillus is more important than the spirochete of Vincent. The latter states further that the site of the spindle-shaped anaerobic bacillus is the center, while the aerobic spirochete is found on the surface of the lesion. In pulmonary gangrene, the author says, the odor is more fetid than in bronchospirochetosis because of the lack of air. The author concludes: "Smith reports considerable work done on these organisms and has had success with the arsenicals in their treatment. We must not forget that this type of therapy may do considerable damage, by increasing the hemorrhage, even in small doses."

The Improvement in Our Children: The medical department of the General Post Office has been conducting some research work directed to a comparison of the physique of boys and girls of 16 years of age twenty-five years ago and now. Striking results are shown. A consecutive series was taken of 200 boys whom they had examined between the years 1905 and 1908, when the average weight of the group was 8 st. 3 lb., and the average height 5 ft. 5 in. A similar consecutive series of 200 boys of the same age examined during the last three years showed that the average weight of the boys of today has increased to 9 st. 5 lb., and the average height to 5 ft. 6½ in. The boys are said to have been drawn from the same social class as those of a quarter of a century ago, but they have increased in average weight 16 lb. and in average height an inch and a half. The improvement in the physique of the girls, although slightly less than that of the boys, is quite well marked. Twenty-five years ago, the average weight of 200 girls was 7 st. 12 lb., and their average height was 5 ft. 2½ in. The corresponding figures today were found to be 8 st. 4 lb. for weight and 5 ft. 3½ in. for height. Allowing for the lighter dress worn by girls today, the average increase in weight is estimated to be 9 lb., and in height 1 in. When Dr. H. H.

Bashford, the senior assistant medical officer to the headquarters staff, was asked to what he attributed the improvement, he said: "To a combination of factors: better food, school inspection, that is to say earlier treatment of bad teeth and tonsils, probably better housing conditions, and a general awakening of the working-class conscience to the principles of health. I was surprised to find this considerable difference in the two series of groups. The boys and girls who come to us may be reasonably regarded as an index to the general working-class population. One should remember, too, that the 400 boys and girls recently examined spent part of their infancy in the war years. Yet in spite of that their physique is so much better than that of the boys and girls twenty-five years ago."—Editorial, *D. Surgeon,* Jan. 2, 1932.

An Appeal for Closer Cooperation Between Dental Surgeons and the Medical Profession: Cyril C. W. Maguire (*D. Surgeon,* Jan. 23, 1932) emphasizes the need for closer cooperation between dentist and physician in an effort to best serve the needs of the patient with dental ills complicated by systemic conditions, with which the oral condition may be merely associated or for which it may be largely or entirely responsible. He deplores the fact that wholesale extraction of teeth was indulged in when it was definitely established that dental sepsis was implicated in many serious affections in remote organs or members of the body, but believes that the pendulum of professional opinion has swung almost too far in the opposite direction in the reaction arising from the situation just mentioned. He regards cooperation between the professions as the only solution of the problem to the satisfaction of all concerned. Three cases are cited as illustrative of this need of cooperation. In one, a septic condition was found to be due, not to a recent abortion, as was supposed, but to the retention of several roots. In the two other cases, extraction in the presence of a heart lesion unknown to the dentist was followed by an exacerbation of the condition and death within a few months. The author suggests that all root filled teeth be examined roentgenographically at frequent intervals. As a means of remedying the present lack of cooperation, the author suggests attendance of both dentists and doctors at joint meetings where these matters are most likely to be discussed with mutual confidence; that dental education be made to include a broader observation and study of clinical and pathologic material which illustrate the physician's point of view in dental work, i. e., the medical aspects of dentistry; close cooperation between general practitioner and dental surgeon, when the patient is referred to the latter by the former with instructions to remove the teeth, i. e., an attitude of professional equality, which will be dependent on a broadening of the dental curriculum; improved interpretation of roentgenograms, based on a correlation of roentgenographic evidence and subsequent findings on extraction, and finally, the keeping of records, to show when teeth were root filled, for the purpose of frequent checkups, or when extracted, and the systemic results, if any, in the latter cases.

Preventable Dental Deformities: McKeag (*Brit. M. J.,* July 25, 1931) calls attention to the fact that mouth breathing, whatever its cause, can often be noted and steps taken to cure it by the physician, but this must be done at an early stage. Similarly, thumb sucking, lip biting and tongue biting can be investigated by the physician and the parents warned of the probable consequences. There is no need to emphasize the necessity for care in the feeding of the mother and young child. Milk and cod liver oil help to produce well calcified teeth. Hard food develops the jaws and allows room for the full complement of thirty-two teeth. Apples and other fruit cleanse the teeth from acid-producing carbohydrates. Should decay occur whether in deciduous or in permanent teeth, the sooner the child is brought to the dentist, the better. It is far easier for the medical profession than for the dentists to educate the public and stamp out the fallacy that the first teeth do not matter much. There are many opportunities in which a few timely words from the doctor could save his patients from many of the deformities of malocclusion, which are real and none the less serious because they are so common.—Abstr. *J. A. M. A.*

Agranulocytosis Following Treatment with Neo-Arsphenamin: After reviewing the literature on agranulocytosis following antisyphilitic treatment with neo-arsphenamin, Essenfeld (*München. med. Wchnschr.,* Nov. 27, 1931) gives the clinical histories of two cases from his own observation. In the first instance, the agranulocytosis developed shortly before the end of the first series of neo-arsphenamin injections; in the second case,

it developed immediately after. In both patients, icterus was absent, but a severe thrombopenia (without hemorrhagic diathesis) existed. In both cases, the disease had a fatal outcome. The author is convinced that the agranulocytosis was caused by the neoarsphenamin treatment and not by the syphilis.—Abstr. *J. A. M. A.*

The Things That Make Surgery Safe: Surgery will never be as safe as it should be until we return to first principles, until we insist that no man shall be permitted to practice it unless he is possessed, unless he proves himself to be possessed, of at least four things, a natural aptitude, adequate knowledge, sound judgment, and that quality which, for lack of a better name, we call the surgical conscience. I am far from believing that good surgeons cannot be molded out of most unpromising clay, for I have seen the miracle happen many times, but I have never seen a man become a good surgeon who did not have at least some natural aptitude. I have never seen a man, whatever his other qualifications, become a good surgeon who did not like to do things with his hands, who did not know how to use his hands swiftly, gently and surely. We are fond of saying, and we are quite correct in saying, that there is more to the practice of surgery than mere craftsmanship. But let us not forget the tremendous importance of craftsmanship. The surgeon must do his work swiftly and accurately, he must, in his actual performance, as Lord Moynihan says, make of surgery a merciful art. The fact that under anesthesia operations can be done deliberately today must not be construed to mean that time is of no consequence. Time is of the greatest consequence. An operation that is unduly prolonged increases the patient's risk and is usually a very clear indication that the surgeon who is doing it frankly does not know the mechanical part of his task. . . . The tissues of the human body can be insulted up to a certain point; after that point the retribution is swift and sure, and the surgeon who does not know how to be dexterous will do well to remember that fact.—C. Jeff Miller, in *Am. J. Surg.*, August, 1931.

MISCELLANY

SOCIAL INSURANCE: GOVERNMENTS, INEFFICIENT, CORRUPT OR BOTH (Cont.)

By Edward H. Ochsner, M.D., Chicago, Ill.

The founders of our government subdivided it into three branches: the administrative, the legislative and the judiciary. This was done on the theory that there were three distinct functions to be performed and that the three branches would each act somewhat as a check and balance wheel on the others. This seemed logical at the time, and this division undoubtedly has many advantages, but our founders did not and could not foresee one of its dangers and one of the abuses to which it would lead; namely, the practice of sidestepping duty and responsibility. One of the chief governmental indoor and outdoor sports today is "passing the buck," with an "open season" the year round.

In a project involving as many problems as does social insurance, all the branches of the government would be involved in its execution: the administrative in administering it, the legislative in enacting the necessary laws and the judiciary in adjusting them. Let us then consider briefly how the different branches have deported themselves in the more recent past. Let us start by examining just one typical administrative activity of both the federal and the state governments.

Individual members of the medical profession have repeatedly called attention to the great need of a careful study of all delinquents and criminals in our state and federal institutions in order to determine the mental and physical condition of each member of these two classes with a view to their rehabilitation and possible reclamation, and yet almost nothing has been accomplished along these lines by governmental agencies. Frank L. Rector, who recently completed a survey under the auspices of the National Society for Penal Information on health and medical work in all state and federal prisons and adult reformatories, states unequivocally that in not one of these institutions is there a well-rounded balanced medical and health program. While some of them provide acceptable accommodation for the care of the acutely

sick or injured, there is little or no provision for the rehabilitation of the physically handicapped so that they will be better equipped for earning an honest living after their discharge to civilian life.

Just one typical example: On the day that Dr. Rector visited the Ohio State Penitentiary, there were 4,475 prisoners within its walls, of which 156 were hospitalized. There was but one physician on the staff, all other attendants at the hospital being prisoners. While the physician was nominally on a full-time basis, he was carrying on an outside private practice as his salary from the state was insufficient to meet his living expenses. What can one part-time physician accomplish with so many patients, a large percentage of whom are physically handicapped, mentally abnormal and emotionally maladjusted? Ohio is a fair example of prevailing conditions. In most of the other penitentiaries and in the federal prisons, conditions are no better, and in some are even worse.

Now let us investigate some of the legislative problems. While nearly every legislative body contains some men of outstanding ability, the great majority of legislators have not the slightest conception of what is required of one in their position and blindly follow their party bosses, who are not generally known for their altruism, their patriotism or their burning desire to promote the public welfare. One of the worst features of our legislative activities is the fact that a small well-organized and insistent minority can usually get its measures enacted into law unless some other group is adversely affected by the proposed legislation and makes a counterattack.

Another bad method of securing legislation is the system of trading. There was an interesting occurrence of this sort in the state of Illinois in 1923. About that time, a Chicago mayor was disgracing not only his city and state but also the nation by the slogan, "Hit King George on the snoot." A free citizen from the corn lands of the state decided that he would like to be sent to the state legislature, took up the battle cry, had just one plank in his platform, namely, to make the American language the official language of the state, and was elected. By use of extensive vote trading, he secured the passage of the following:

"OFFICIAL STATE LANGUAGE

"An act establishing the American language as the official language of the State of Illinois. (Approved June 19, 1923. L. 1923. p. 7). Preamble. 177. (American language). 1. Be it enacted by the people of the State of Illinois, represented in the General Assembly:

"The official language of the State of Illinois shall be known hereafter as the 'American' language."

(So much for administrative and legislative inefficiency. The next article will take up the judiciary).

MAY DAY—NATIONAL CHILD HEALTH DAY, 1932

The lowest infant mortality rate ever attained by the cities of this country was that of 1930, according to the statistical report on infant mortality, based on the records of 860 cities in the birth registration area of the United States, just issued by the American Child Health Association. The 1930 rate—62.2 deaths for every thousand live births—is four points lower than that of the preceding year, when it was 66.2.

Inclusion in the birth registration area depends on registration laws accepted as satisfactory by the United States Census Bureau and on assurance that at least 90 per cent of the births are registered. All but two states are within this area. The 860 cities reporting from this area had a population of 10,000 or over in 1930. The report gives also infant mortality rates for fourteen cities outside the birth registration area, eight of them in Texas and six in South Dakota.

Seattle, with an infant mortality rate of 37, heads the list of cities with a population of over 250,000. San Francisco ranks next, with 40, and Portland, Ore., is third, with a figure of 41. In the preceding year, 1929, Portland led, Seattle was second and Minneapolis, third.

Among the ten largest cities in the country in 1930, two are tied for first place, Chicago and St. Louis, each with an infant mortality rate of 54. Cleveland stands next with 55, and New York follows with 57. Boston and Pittsburgh foot this group with 69 as their figure. Nine of these ten cities show lower rates in 1930 than in 1929.

Long Beach, Calif., with a rate of 43, leads the cities in the 100,000-250,000 class. Oak

Park, Ill., stands at the top of the 50,000-100,000 class with a rate of 28. Alameda, Calif., with 21 as its figure, ranks first in the 25,000-50,000 class.

Among the smallest cities, with populations of 10,000-25,000, Shorewood, Wisc., is at the top with an infant mortality rate of 0.

As in other years, the states on the Pacific Coast and in the Rocky Mountains offer babies the best chance for survival. The lowest urban infant mortality rate is in the State of Washington, where the figure is 41. Idaho comes second with a rate of 44, Oregon third with 48, and then three states each with 50, Utah, Nebraska and Montana.

It has been customary to publish this report in the middle of the year, Samuel J. Crumbine, general executive of the American Child Health Association announces, but a delay was necessary this time because of the work involved in the decennial census of 1930, which prevented the Census Bureau from issuing as early as in previous years its summary of provisional birth, death and infant mortality figures. The purpose of this statistical report, prepared under the direction of George Truman Palmer, director of the association's division of research, is to stimulate public opinion to support the work being done by the health officials and volunteer health agencies of the country in endeavoring to reduce the number of infant deaths.

WESTINGHOUSE ANNOUNCES DEVELOPMENT FOR READING X-RAY FILMS

An improvement in the equipment used by physicians for illuminating x-ray films when they are reading them to make their diagnosis has just been announced by the Westinghouse X-Ray Company, Inc. Physicians who have examined x-ray films with this new equipment have commented on the ease with which the many fine shadows in the films which mean much in diagnosis can be detected, not only in doubtful cases, but even in routine cases as well.

The improvement is said to be the result of three new developments. The first of these is a radically different type of incandescent lamp, giving a far more intense light than the lamps heretofore available for this purpose. This greater intensity is obtained through the use of a newly discovered type of lamp filament construction. The second development is a new type of diffusing glass, technically known as blue daylight glass. The third development is a new type of "viewing box." The new lamp is mounted in the rear of the inside of this box, it is explained, and the new glass on the front. The intense light from the lamp is evenly distributed over the glass and shines through, giving a very strongly illuminated field. The x-ray films are clipped on the front of the glass for examination.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, Buffalo, N. Y., September 12-16.

American Board of Orthodontia, Toronto, Canada, May 16-17.

American Dental Society of Europe, Baden-Baden, Germany, August 9-11.

American Society of Orthodontists, Toronto, Canada, May 18-20.

Fédération Dentaire Internationale, Zurich, Switzerland, August 2-9.

Interstate Dental Association, Bordentown, N. J., July 11-13.

Italian Stomatologic Congress, Rome, September.

National Association of Dental Examiners, Buffalo, N. Y., September 10.

Northern Ohio Dental Association, Cleveland, June 6-9.

Society for Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

Southern Society of Orthodontists, Knoxville, Tenn., October 31-November 2.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

March

Connecticut, at New Haven (March 30-April 1).

April

Alabama, at Birmingham (12-14).
California, at Oakland (4-6).
Kansas, at Wichita (25-27).
Kentucky, at Louisville (4-6).
Louisiana, at Monroe (14-16).
Michigan, at Detroit (11-13).
New Jersey, at Atlantic City (13-15).
Oklahoma, at Muskogee (19-23).

May

Illinois, at Springfield (10-12).
Indiana, at Indianapolis (16-18).
Iowa, at Des Moines (3-5).
Maryland, at Baltimore (2-3).
Massachusetts, at Boston (2-5).
Missouri, at Joplin (16-18).
Nebraska, at Lincoln (16-19).
New York, at Albany (11-13).
North Carolina, at Elizabeth City (2-4).
South Carolina, at Greenville (23-24).
South Dakota, at Sioux Falls (16-18).
Texas, at Dallas (17-20).
Tennessee, at Memphis (9-11).
Vermont, at Burlington (18-20).
Virginia and West Virginia, at Winchester, Va. (16-18).

June

Arkansas, at Little Rock (6-8).
California (Southern), at Los Angeles (13-15).
Colorado, at Estes Park (20-22).
Georgia, at Atlanta (8-10).
Maine, at South Poland (16-18).
Montana, at Bozeman (June 30-July 2).
Nevada, at Reno (4).
New Hampshire, at North Conway (1-3).
Wisconsin, at Milwaukee (7-9).
Wyoming, at Thermopolis (27-28).

July

New Jersey, at Bordentown (11-13).
Washington, at Seattle (5-9).

STATE BOARD OF DENTAL EXAMINERS

Alabama, at Birmingham, June 20. E. W. Patten, Secretary, Comer Bldg., Birmingham.

Connecticut, at Hartford, June 22-25. Almond J. Cutting, Recorder, Southington.

Florida, at Jacksonville, June 22-25. R. P. Taylor, Secretary, St. James Bldg., Jacksonville.

Indiana, at Indianapolis, June 15. J. M. Hale, Secretary, Mt. Vernon.

Iowa, at Iowa City, May 30-June 2. Hardy F. Pool, Secretary, Mason City.

Kansas, at Wichita, April 25-27. Fred A. Richmond, Federal Reserve Bldg., Kansas City.

Kentucky, at Louisville, June 8-11. Robert L. Sprau, Secretary, 970 Baxter Ave., Louisville.

Louisiana, at New Orleans, June 15-18. Joseph L. Webre, Secretary, Audubon Bldg., New Orleans.

Maine, at Augusta, June 20-22. Alton H. Swett, Secretary, 192 State St., Poland.

Massachusetts, at Boston, June 14-17. W. Henry Grant, Secretary, State House, Boston.

Minnesota, at Minneapolis, June 10-16, W. H. Smith, Secretary, 2337 Central Park Ave., Minneapolis.

Nebraska, at Omaha and Lincoln, June 13-18. Mrs. Clark Perkins, Director, Lincoln.

New Jersey, at Trenton, June 27-July 2. John C. Forsyth, Secretary, 148 W. State St., Trenton.

Ohio, at Columbus, June 27. M. H. Jones, Secretary, 1553½ N. 4th St., Columbus.

Pennsylvania, at Pittsburgh and Philadelphia, June 16-20. W. A. McCready, Secretary, 1115 Highland Bldg., Pittsburgh.

Rhode Island, at Providence, June 28-30. Albert L. Midgley, Secretary, Union Trust Bldg., Providence.

Texas, at Houston, June 20-24. A. L. Nygard, Secretary, Medical Arts Bldg., Dallas.

Utah, at Salt Lake City, June 27-30. H. D. Brockbank, Secretary, Medical Arts Bldg., Salt Lake City.

Vermont, at Montpelier, June 27-29. H. B. Small, Secretary, Burlington.

Wisconsin, at Milwaukee, June 13-18. S. F. Donovan, Secretary, Tomah.

CONNECTICUT DENTAL COMMISSION

The Connecticut Dental Commission will meet in Hartford, June 22-25, for the examination of applicants for license to practice dentistry and dental hygiene, and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

ALMOND J. CUTTING, *Recorder*
Southington

VERMONT BOARD OF EXAMINERS

The Vermont State Board of Dental Examiners will meet, June 27-29, at the State House, Montpelier, to examine applicants for license to practice dentistry and dental hygiene. All applications, accompanied by examination fee, must be in the hands of the secretary at least ten days before the meeting. For applications and other information, address

H. B. SMALL, *Secretary*
Burlington

FEDERATION DENTAIRE INTERNATIONALE

The Fédération Dentaire Internationale will meet in Zurich, Switzerland, August 2-9.

RHODE ISLAND BOARD OF REGISTRATION IN DENTISTRY

A meeting of the Rhode Island Board of Registration in Dentistry for the examination of applicants for license to practice dentistry and dental hygiene will be held at the State House, Providence, June 28-30. Candidates shall present to the secretary of this board at least one week before the examination an application with fee and photograph. For applications and further information, address

ALBERT L. MIDGLEY, *Secretary*
Union Trust Bldg.
Providence

NATIONAL ASSOCIATION OF DENTAL EXAMINERS

The National Association of Dental Examiners will meet in Buffalo, N. Y., September 10.

GEORGE L. POWERS, *Sec'y-Treas.*
Memphis, Tenn.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS

The next examination of applicants to practice dentistry in the State of Wisconsin will be held at Marquette University Dental Department, Milwaukee, June 13-18. Application and detailed information can be obtained from the secretary.

S. F. DONOVAN, *Secretary*
Tomah

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

The Massachusetts Board of Dental Examiners will hold an examination for registration of dentists and oral hygienists in Boston, June 14-17. Full information, application blanks, etc., can be secured at the office of the secretary, Room 141, State House, Boston. All applications must be filed at the office of the secretary at least ten days before date set for examination.

W. HENRY GRANT, *Secretary*

UTAH STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Utah State Board of Dental Examiners will be held at the Capitol Bldg., Salt Lake City, June 27-30. Applications must be filed with the Department of Registration ten days prior to date of examination. Information can be had by writing the Department of Registration or direct to the secretary.

H. D. BROCKBANK, *Secretary*
Medical Arts Bldg.
Salt Lake City

BOARD OF DENTAL EXAMINERS OF ALABAMA

The Board of Dental Examiners of Alabama will conduct its next annual dental and dental hygiene examinations in Birmingham, June 20. Failure to forward all credentials to the secretary-treasurer's office at least two weeks before the date of examination will have the effect of barring the applicant from examination. For further information, address

E. W. PATTEN, *Sec'y-Treas.*
Comer Bldg.
Birmingham

STATE OF NEBRASKA BUREAU OF EXAMINING BOARDS

The next dental examination of the State of Nebraska Bureau of Examining Boards will be held, June 13-18. The first three days, practical work will be given at the Creighton College of Dentistry, Omaha, and also at the University College of Dentistry, Lincoln. The last three days, written work will be given at the State House, Lincoln.

MRS. CLARK PERKINS, *Director*
Lincoln

LOUISIANA STATE BOARD OF DENTISTRY

The next examination of applicants to practice dentistry in Louisiana will be held at Loyola University, School of Dentistry, New Orleans, June 15-18. Applications properly executed, together with college diploma and fee of $25 must be filed with the secretary at least ten days prior to date of examination.

JOSEPH L. WEBRE, *Sec'y-Treas.*
Audubon Bldg.
New Orleans.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

The Florida State Board of Dental Examiners will hold its annual examination, June 22-25, at Jacksonville, to examine applicants for license to practice dentistry and dental hygiene. All applications, accompanied by photograph, examination fee, credentials, etc., must be in the hands of the secretary at least thirty days before the date of the examination. For application blanks and further information, apply to

R. P. TAYLOR, *Sec'y-Treas.*
St. James Bldg.
Jacksonville.

TEXAS STATE BOARD OF DENTAL EXAMINERS

The Texas State Board of Dental Examiners will hold its next examination in Houston, June 20-24. Applications, which must be accompanied by the regulation fee of $25, should be in the hands of the secretary at least ten days before date of examination.

A. L. NYGARD, *Secretary*
Medical Arts Bldg.
Dallas

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

A competitive examination to establish a waiting list of seven candidates qualified for appointment to the Dental Corps of the Navy is scheduled to begin May 2 at the U. S. Naval Medical School, Washington, D. C. Immediate temporary appointments may be provided for two or more of the candidates found qualified. A candidate for appointment in the Dental Corps must be a citizen of the United States, and must be between 21 and 32 years of age at the time of appointment, a graduate of a standard dental college, of good moral character and of unquestionable professional repute. Credentials relative to character, citizenship, date of birth and education must be submitted and approved before an applicant can be authorized to appear for examination. A circular which contains full information relative to the Dental Corps and describes the method of making application for appointment can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

C. E. RIGGS, *Surgeon-General*
U. S. Navy

DENTAL SOCIETY OF THE STATE OF NEW YORK

The sixty-fourth annual meeting of the Dental Society of the State of New York will be held at the Hotel Ten Eyck, Albany, May 11-13. Headquarters will be the Ten Eyck Hotel and reservations should be made direct. The executive council will convene for the transaction of the business of the society, May 10, 3 p. m. For further information, address

A. P. BURKHART, *Secretary*
57 E. Genesee St.
Auburn

NEW JERSEY DENTAL SOCIETY-INTERSTATE DENTAL ASSOCIATION

The New Jersey Dental Society will be host to the Interstate Dental Association at the nineteenth annual meeting of the latter organization, to be held at the State Manual Training School, Bordentown, July 11-13. Programs will be mailed to members. Nonmembers can secure programs from Robert H. Thompson, 466 W. Broad St., Westfield, N. J.

JAMES E. LEE, *Chairman*
Publicity Committee

NEW YORK ACADEMY OF DENTISTRY

The next meeting of the New York Academy of Dentistry will be held at the Yale Club, April 28, with dinner at 6:30, and the business meeting, with election of officers, and the essay of the evening (by Sir Wilfred Grenfell) at 7:45 p. m.

LOWRIE J. PORTER, *Secretary*
730 Fifth Ave.
New York City

VERY RECENT BOOKS* WORTH BORROWING† OR BUYING‡ from the LIBRARY BUREAU of the AMERICAN DENTAL ASSOCIATION

212 E. Superior St., Chicago, Ill.

Beck, Dorothy F.	Cost of equipping a dental office. Chicago, University of Chicago Press, 1932. $1.10.
Bogert, L. J.	Nutrition and physical fitness. Philadelphia, Saunders, 1931. $3.00.
Bosworth, H. J.	Dental economics. Chicago, Bosworth Institute, 1932. $10.00.
Bregstein, S. J.	Business conduct of an ethical practice. New York, Dental Items of Interest, 1932. $4.00.
Colyer, J. F., & Sprawson, Evelyn	Dental surgery and pathology. New York, Longmans, 1931. $12.50.
Davis, M. M.	Paying your sickness bills. Chicago, University of Chicago Press, 1931. $2.50.
Doxtater, L. W.	Procedures in modern crown and bridge-work. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1931. $8.00.
Ennis, L. M.	Dental roentgenology. Philadelphia, Lea & Febiger, 1931. $6.50.
Farkasch, Oscar	Dilemmas of dentistry. New York, Dodd, 1931.
Felcher, F. R.	Art of porcelain in dentistry. St. Louis, Mosby, 1932. $9.00
Fine, Samuel	Principles and practice of dental assistant. Worcester, Mass., Hamilton Pub. Co., 1931.
Gottlieb, B., & Orban, B.	Die Veränderungen der Gewebe bei übermässiger Beanspruchung der Zähne. Leipzig, Thieme, 1931.
Graves, Lulu G.	Foods in health and disease. New York, Macmillan, 1932. $3.50.
Harding, T. S.	Degradation of science. New York, Farrar, 1931. $3.00.
Hildebrand, G. Y.	Studies in masticatory movements of human lower jaw. Berlin Gruyter, 1931. (No purchase orders accepted.)
Hodgen, J. D., Millberry, G. S., & Shell, J. S.	Practical dental metallurgy. St. Louis, Mosby, 1932. $3.75.
Ivy, R. H., & Curtis, Lawrence	Fractures of the jaws. Philadelphia, Lea & Febiger, 1931. $4.50.
Jordan, E. O.	Textbook of general bacteriology. Philadelphia, Saunders, 1931. $6.00.
Leuck, Miriam S.	Study of dental clinics in the United States: 1930. Chicago, University of Chicago Press, 1932. $1.10.

*For list of less recent books see October, 1931, issue of THE JOURNAL.

†Books may be *borrowed* by members of the Association for a period of one week after date of receipt; and if they are not reserved for some one else, the period will be extended on request. A deposit of $2.00 for each volume to be sent at one time should accompany all request for books. This will be refunded on return of books.

‡If you wish to *purchase* books, indicate plainly which books you desire and enclose check with order.

Leven, Maurice, & Beck, Dorothy F.	Practice of dentistry and the incomes of dentists in twenty states: 1929. Chicago, University of Chicago Press, 1932. $2.10.
Lloyd-Williams, E.	Dental mechanics; a manual for students and junior practitioners. London, Bale, 1931. $2.00.
McCoy, J. D.	Applied orthodontia. Philadelphia, Lea & Febiger, 1931. $4.50.
Okumura, Tsurukichi	Present status of dentistry in Japan. Tokyo, Japan, Japan Dental Assn., 1931. (Pamphlet.) (No purchase orders accepted.)
Palmer, G. T., Derryberry, Mahew & Van Ingen, Philip	Health protection for preschool child; national survey of use of preventive medical and dental service for children under six. New York, Century, 1931. $2.50.
Phelps, Edith M.	Socialization of medicine. New York, Wilson, 1930.
Ray, K. W.	Metallurgy for dental students. Philadelphia, Blakiston, 1931. $3.00.
Rukeyser, M. S.	Doctor and his investments. Philadelphia, Blakiston, 1931. $2.50.
Sherman, H. C.	Vitamins. New York, Chemical Catalogue Co., Inc., 1931. $6.00.
Simpson, C. O.	Toothsome topics. St. Louis, University Press, 1931. $2.50.
Toverud, K. U., & Toverud, Guttorm	Studies on the mineral metabolism during pregnancy and lactation and its bearing on the disposition to rickets and dental caries. Uppsala, Almqvist & Wiksells Boktryckeri, A-B, 1931. (Pamphlet.) (No purchase orders accepted.)
Webster, A. E.	Manual for dental assistants. Philadelphia, Lea & Febiger, 1932. $3.50.
Winter, Leo.	Textbook of exodontia. St. Louis, Mosby, 1931. $10.00.

Give Written Instructions to Your Denture Patients

A little booklet entitled "Your New Teeth" may be procured for distribution to your patients from the Library Bureau of the American Dental Association. This booklet is intended primarily for the patient who is wearing dentures for the first time. It enumerates some of the difficulties that may be encountered when one first wears dentures and offers suggestions as to how these difficulties may be overcome. There is also much of interest to the patient who has been wearing dentures, as information is given regarding the care, repair and rebasing of dentures. The information in this booklet was taken from the article entitled "Instructions for the Edentulous Patient," by B. L. Hooper, which was published in The Journal, for February, 1932. The price of these booklets is: 25 for $1.00, 50 for $1.50 and 100 for $2.00. Kindly send remittance with order.

PACKAGE LIBRARIES*†
Most Frequently Requested
from the
LIBRARY BUREAU
of the
AMERICAN DENTAL ASSOCIATION
212 East Superior Street, Chicago, Ill.

Alveolectomy.
Amalgam fillings and physical properties of amalgam.
Articulation, occlusion and mandibular movements.
†Broken needles.
Business side of dentistry.
Cast gold inlays.
Casting gold, including inlays and dentures.
Cavity preparation.
†Child psychology.
Children's dentistry.
Clasps—wire and cast.
Cleft lip and palate—etiology and surgical treatment.
Community and school dental service.
Conduction anesthesia.
Cysts and tumors of mouth.
Dental assistants.
†Dental care of the preschool child.
Dental clinics.
Dental economics.
†Dental erosion.
Dental ethics.
Dental hygienists.
Dental health education.
Dentistry as a career and the status of the dentist.
Denture bases—discussion of materials.
Denture casting.
Diathermy in dentistry.
Diet and nutrition in relation to teeth.
Diet in pregnancy.
†Dry socket.
†Education of denture patients.
Endocrine glands in relation to teeth.
Esthetics in denture construction.
Ethyl chlorid.
Ethylene anesthesia.
Etiology of caries.

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*Each package library contains information on one of the subjects listed and is composed of reprints, magazine clippings, etc., on that subject only. The packages are loaned to members of the Association for a period of one week after date of receipt. Unless the material is reserved for another borrower, an extension of time will be granted on request. The charge for borrowing a package library is 50 cents. The rental fee should accompany the request for a package library. No packages are sold. For names of additional package libraries, see THE JOURNAL for June, 1931, or write for list.

†These packages contain less than the usual number of articles.

Etiology of malocclusion and preventive orthodontia.
Etiology of pyorrhea and its relation to systemic conditions.
Examination of the mouth and oral diagnosis.
Extraction of teeth.
Fixed and removable bridgework.
Fixed bridgework.
Focal infection.
Focal infection in relation to diseases of the eye.
Fractures of the jaws.
Full denture construction.
Gold foil.
Habits as factors in malocclusion.
†Hemophilia or excessive hemorrhage following extraction.
Hereditary influences in malocclusion.
History of dentistry.
Hospital dental service.
†Hypercementosis and excementosis.
†Immediate denture service.
Impacted teeth and their removal.
Impacted third molars.
Impression technic.
Indirect inlay technic.
Industrial dental service.
Influence of deciduous teeth and first permanent molars on occlusion.
Interpretation of roentgenograms.
Investment compounds and technic.
Lectures to nurses.
Local anesthesia.
Local anesthesia: contraindications and untoward results.
Maxillary sinus and antrum—diseases and treatment.
Monson's theory.
Mottled enamel.
Mouth hygiene.
Muscle exercises and training in orthodontia.
Nitrous oxid-oxygen analgesia.
Nitrous oxid-oxygen anesthesia.
Oral diagnosis.
Oral diagnosis with reference to roentgen ray.
Oral manifestations of systemic conditions.
Organized dentistry.
Orthodontia and its relation to dentistry and medicine.
Orthodontic appliances.
†Orthodontic treatment of impacted cuspids.
Osteomyelitis of the jaws.
"Panel" or insurance dentistry.
Partial dentures.
†Pinledge and pinlay attachments.
Plastic surgery.
Porcelain in dentistry.
Porcelain inlays.
Porcelain jacket crowns.
Postoperative complications and care.
†Pregnancy and dental disease.
Preoperative examination of patients.
†Preparation of cavities with hypersensitive dentin.
Preventive orthodontia.

Procain (novocain) dermatitis.
Prophylactic odontotomy.
Pulp conservation including pulp capping and cavity lining.
†Pulp pathology.
Relation between dental conditions and mental health of insane.
Relation of the dentist to the physician.
†Removable bridgework—discussing various types of attachments.
Retainers used in orthodontia.
†Retrusion of the mandible causing impaired hearing.
Root canal treatment.
†Salivary calculus.
Should dentistry be advertised?
Silicate cements.
Sterilization of dental instruments.
Stories and rhymes for children.
Studies of saliva.
Suggestions for a talk to mothers.
Surgical treatment of pyorrhea.
Three-quarter crowns.
Tooth arrangement for full dentures.
Toothbrushes, tooth pastes and mouth washes.
Traumatic occlusion.
Trigeminal neuralgia.
Trismus and ankylosis.
†Tuberculosis and dentistry.
Ultraviolet ray in the treatment of pyorrhea.
Ultraviolet ray therapy in dentistry.
Use of elevators in extraction.
Value of dental service in schools.
Value of roentgen-ray examinations in orthodontia.
Various studies of or pertaining to saliva.
Vincent's infection.
Wax expansion method.
†Waxes.
Willett's articles.

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